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FORESTRY ABSTRACTS

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NOTE—In order to economize in the use of paper during the present emergency period it has been found necessary to change the setting of *Forestry Abstracts*, reducing slightly the size of type and increasing the number of words per page. This change is intended as a war-time measure only.

Technical Communications—Imperial Forestry Bureau.

The publication of the first *Technical Communication* of the Imperial Forestry Bureau—"Gas Producers for Motor Vehicles and their Operation with Forest Fuels"—was announced in a previous number of *Forestry Abstracts* (Vol. 3, No. 3). It is planned to issue further publications in this series at irregular intervals on subjects of current interest and of practical significance in forestry. In this connection it may be noted that a standing order for *Technical Communications* of this Bureau will ensure the despatch of copies immediately on publication, cumulative accounts being issued at the end of each year (in December). Those who do not wish to place a standing order can be sure of receiving notices of all future forestry publications by registering their names and addresses for this purpose. In either case correspondence should be addressed:—Imperial Agricultural Bureaux, Central Sales Branch, Agricultural Research Building, Penglais, Aberystwyth.

FORESTRY ABSTRACTS

VOLUME 4

1942

NUMBER 1

STATE CONTROL OF PRIVATE FORESTS IN POLAND*

By A. ZUKOWSKI, and D. COTON, B.Sc.

INTRODUCTION.

Before giving the substance of the Polish Act for State Control of Private Forests and the details of its enforcement and influence, it will be useful to consider briefly Poland's position among the timber-producing countries of the world prior to the present conflict, the importance of Poland's timber export trade in her general economy, and the conditions that led to the State control of private forests in Poland.

Poland's Timber Trade.

Although the area of Polish forests is only 0.3 per cent. of the world's forest area and 3 per cent. of that of Europe, it is stated that their annual growth in 1928 amounted to 6 per cent. of the total European and 2 per cent. of the world's annual increment.

In 1937 Poland exported 97,125,000 cu. ft. of timber with a total value of £8,120,000, which represented 5 per cent. by volume of the world's timber export for that year. It occupied first place in the export of sleepers (21.5 per cent. of the world's exports) and third place in the export of plywood (17 per cent. of the world's exports). The relative position of the various products comprising the Polish timber exports in 1937 was as follows:

Sawn timber	54	per cent.	Boxes, cases, etc.	1.5	per cent.
Pulpwood	12	" "	Poles	1	" "
Roundwood	11.5	" "	Planed wood	1	" "
Sleepers	11	" "	Cooperage	1	" "
Pitwood	6.5	" "	Fuel	0.5	" "

The principal markets for these exports were:

Importing country	Percentage of timber exported by:	
	weight	value
Great Britain	51	44
Germany	19	18
Holland	10	10

Timber occupied an important place in the export trade of the country throughout the period 1919-39. Its contribution to the total value of exports rose from 12 per cent. in 1921 to a maximum of 16.5 per cent. in 1930 and thereafter maintained this level with but small fluctuations. On the export list, timber occupied third place by value in 1937 and made up 13 per cent. by weight of the total exports, being second only to coal in this respect.

Forest Increment, Ownership and Composition.

In 1936 the forests supplying Poland's timber requirements occupied 21,340,000 acres, 22 per cent. of the total area of the country. The average annual increment per acre as calculated by the Ministry of Agriculture in 1926 was 40 cu. ft. for State forests, 22 cu. ft. for private forests of less than 125 acres, and 34 cu. ft. for private forests of over 125 acres, giving an average annual growth of 34 cu. ft. for all forests.

The State owned 37 per cent. of the forest area (7,810,000 acres) in 1936 and 63 per cent. (13,530,000) was under private ownership. The private forests were distributed in 1938 as follows:

Size	Numbers of owners	Area in acres
Less than 125 acres	464,248	2,324,630
From 125 to 375 acres	5,694	1,167,450
From 375 to 1,250 acres	2,156	1,574,970
Above 1,250 acres	1,596	8,138,590
	473,694	13,205,640†

* A good deal has been written in recent forestry literature, particularly in that of Great Britain and the United States, on the possibilities of some measure of State control of privately owned forests. It is thought, therefore, that a study of the successful application of such control in Poland might be of interest at the present time.—Ed.

† Decrease of about 325,000 acres is due to the purchase by the State of vast private forests in the east of Poland.

STATE CONTROL OF PRIVATE FORESTS IN POLAND

Polish forests consist very largely of softwoods, Scots Pine being the dominant species throughout the country. The proportion of the chief species for all forest areas and the distribution of age classes for private forests is given below, these figures being for 1936 and 1933 respectively:

Species	Percentage of total forest area	Age classes (all species)	Percentage of private forest area
Pine	65	Fellings	9
Spruce	11	1-20 years	27
Silver Fir	3	21-40 "	24
	—79	41-60 "	17
		61-80 "	14
Oak	6	81-100 "	7
Birch and Alder	5	Above 100 years	2
Other spp.	10		
	—21		100

Conditions Leading to State Control of Private Forests.

As a result of the last great war, which on the Eastern front was fought mainly on Polish territory, the forests of Poland were widely devastated and in subsequent years their area was constantly reduced. Thus during the period 1919-35, some 1,987,500 acres of forest (over 9 per cent. of the total forest area in 1919), mostly privately owned, were permanently cleared in the interests of land reform, the abolition of rights, or the consolidation of holdings. Such deforestation was to be expected, as the rural districts of Poland, which were already overpopulated, had to absorb an ever-increasing number of workers who could not find employment in industry. This resulted in a widespread demand for agricultural land and the necessity of clearing some forest land for agricultural use. During the same period 340,000 acres of land not previously bearing forest were planted up, but, in general, the poorer soils were used for this purpose. Thus, there was a substantial reduction in increment as growth on the relatively small area of poor soil could not possibly offset the loss from the larger area of good soil given over to agriculture.

Furthermore, insect epidemics swept through Poland during the period 1921-24. The three pests *Panolis lammea*, *Lymantria monacha*, and *Dendrolimus pini* were particularly destructive in the western Pine forest, where they affected 350,000 acres of State forests and 200,000 acres of private forest land, causing extensive loss of increment and necessitating the clear felling of 150,000 acres of State forest alone. In addition bark beetles (particularly *Ips typographus*) heavily attacked the Spruce forests in the Polish Carpathians where whole stands had to be burnt in order to control the outbreak.

These conditions necessitated more vigorous State Control than had been applied in the past in order to maintain the timber export trade without overcutting. This could be attained only by (a) enforcing a rational system of utilization so as to ensure a sustained yield and the maintenance of the natural types of forest, (b) vigorous limitation of clearances and partitions, (c) efficient afforestation, and lastly (d) by enforcing measures for the prevention and control of insect epidemics. These four points formed the basis of the 1932 Act passed to strengthen and consolidate the control exercised by the State over private forests.

STATE CONTROL ADMINISTRATION.

When Poland was restored in 1918, the country was divided into 16 provinces with areas varying from 6,500 to 14,000 sq. miles, each having an average population of two million people. Provinces were in turn subdivided into counties. The heavily wooded and sparsely populated north-eastern provinces included from 8 to 12 counties of an average area of about 1,350 sq. miles. A Governor, nominated by and directly responsible to the Minister of the Interior, controlled each province, while a Prefect was the chief of the local State administration of each county. Both the Governor and the Prefect were members of the Ministry of the Interior representing the Central Government on the spot, and it was therefore through them that officers of the local administration of other Departments carried out their functions.

Administration of the Control of Private Forests.

The forestry officer for a county, known as a Forestry Commissar, was attached to the office of the local Prefect, and was a university-trained forester. The Commissar worked under the Provincial Forestry Officer, who in turn was attached to the office of the Governor. Both the Forestry Commissar and the Provincial Forestry Officer were appointed by the Ministry of Agriculture and received their instructions from the Section for the Control of Private Forests of the latter Ministry. This section consisted of a Chief with a staff composed of ministerial forestry officers.

As the whole administrative authority on the spot was concentrated in the hands of the Governor and the Prefect, all decisions, orders, permits, etc., dealing with the control of private forests were issued in their respective names, though in practice these officers merely signed and issued drafts prepared by the Forestry Commissar of the county and the Provincial Forestry Officer. The Governor and Prefect were responsible, however, for the local administration of the Government policy and they gave general directions to the officers of the State Control Service; these had to be followed if they did not encroach on the technical side of forestry.

Administration of State Forests.

State forests, although under the Ministry of Agriculture, were administered by a Forest Service entirely independent of that controlling private forests. These Services had nothing in common, and, although members of

both often resided in the same county or provincial town, they were not in touch with each other and no form of co-operation existed between them, due mainly to the essential difference in their functions.

Thus the State officers concerned with the control of private forests had two primary aims, firstly to ensure a sustained yield by approving and enforcing a suitable working plan, and secondly to enforce the provisions of the Act dealing with clearances, forest partitions and the control of insect epidemics. They had no voice in the marketing of crops, their functions being limited to the purely silvicultural side of forest management. Wherever possible they gave friendly advice to private owners but they could also use compulsion where necessary.

In contrast, the State Forest Service had to obtain the highest possible financial returns from the State forests in addition to managing them on a sustained-yield basis. This resulted in a highly developed industrial branch of the Forest Service which controlled a number of very modern sawmills, a plywood factory, the largest wood distillation plant in Europe, and even a factory for the extraction of fruit juices from forest berries, while a cellulose mill was also under consideration. Furthermore, a commercial branch, which was responsible through its own agents for the sale of State timber on the home and foreign markets, developed rapidly and finally came to dominate all other branches of forestry. Thus the State Forest Service concentrated on high incomes through efficient management, utilization and marketing of produce, and State Forests were looked upon by private forest owners as well as by the private timber trade and industry as powerful and serious competitors. It is not surprising, therefore, that these differences in character and field of activity led to the complete separation of the two Services.

THE ACT FOR STATE CONTROL.

During the first years following the restoration of Poland in 1918, the control of private forests was based on provisions found in the Austrian, Russian and Prussian codes, still in force at that time. When, however, the Polish Act on State Control of Private Forests was decreed in 1927, it placed State control of private forests on a common footing throughout the country. This Act was redrafted in 1932 and the main provisions were then as follows:

Polish Act for State Control of Private Forests (1932)

Art. 1. This Act applies to all 'forests not owned by the State' and to 'forest lands' that were classified as forest land and entered as such in the land register. The provisions of the Act, however, do not apply to lands cleared of trees and stumps and transferred to agricultural or some other use before January 1, 1927.

Articles 2-7, 9-18, and 20 of this Act do not apply to forests of less than 25 acres provided they are not subject to rights or listed as protection forests.

Clearing.

Art. 2. Authority for clearing forests or forest lands can only be granted if justified by:

- (a) Higher benefit to be obtained from the use of the land for purposes other than forestry.
- (b) The afforestation of an equal area three years before the proposed clearing.
- (c) The requirements of land reform (abolition of rights, consolidation of holdings, etc.).
- (d) The general interest of the public.

Art. 3. If a stand has been felled and the stumps have not been grubbed up within the three-year time limit imposed, then the cleared land must be reforested.

Art. 4. Forests and forest lands cleared without authority must be reforested; if this is not the best use of the land in the public interest then the owner can be ordered to reforest an equal area of land elsewhere.

Management.

Art. 5. Reforestation of all bare forest lands is compulsory.

Art. 6. Reforestation can be carried out by:

- (a) Planting within three years of the felling.
- (b) Natural regeneration.

The authorities are entitled to decide whether artificial or natural regeneration should be applied, and can extend the three-year limit stipulated for reforestation.

Art. 7. If afforestation is not feasible without improvement of the land, the time limit for regeneration may be prolonged.

Art. 8. If areas other than forest land have been afforested, they are exempt from taxes for 30 years (this does not apply to para. (b) of Art. 2).

Art. 9. All forests must be worked under the prescriptions of a working plan or programme. This does not apply to forests whose area is less than 75 acres (125 acres in Eastern Provinces) whether in a single block or several. The authorities should, however, be notified in the case of a proposed annual felling exceeding 2.5 acres and if no objection is raised within two months of the application the felling may be carried out.

Art. 10. A working plan must be based on a survey together with compartment descriptions covering natural conditions and an outline of management. It should contain a résumé of the principles of forest management and planting methods to be applied. The date and compartment of each operation prescribed should be specified and justified from the point of view of rational utilization indicated in the plan.

Art. 11. Forests not exceeding 375 acres (or 625 acres in Eastern Provinces) may be worked according to working programmes instead of working plans.

A working programme must contain:

- (a) A sketch of the forest based on an approximate survey and division of area.
- (b) A short description of the nature and management of the forest.
- (c) The date, site and extent of fellings.
- (d) Dates and method of afforestation.
- (e) A general justification of the proposed operations.

- Art. 12. Two copies of the working plan or programme must be prepared, one of which is returned to the owner after approval. (Three copies have to be made if the forest is subject to rights.)
- Art. 13. If no comment is received within two months of the date of presentation of the plan or programme then fellings and silvicultural operations prescribed for the first year may be carried out.
- Art. 14. Official sanction is required for all changes in the working plan or programme. Changes in the order of annual clear fellings need not be approved by the authorities.
- Art. 15. Arts. 12, 13, and 14 do not apply to forests subject to rights or controlled by Agricultural Chambers.
- Art. 16. In the absence of a working plan or programme the authorities may grant a permit for a felling not exceeding the normal annual coupe if it be in the public interest. This does not apply to forests subject to rights.
- Art. 17. If a forest has been damaged by climatic or other factors to such an extent that amendments to the working plan or programme are required then the plan or programme is suspended until the necessary changes have been made and approved.
- Art. 18. Arts. 7-13 do not apply to:
- (a) Subsidiary yields (removal of dead trees and windfalls).
 - (b) Clear felling of new compartment rides.
 - (c) Thinning of stands up to 20 years.
 - (d) Cutting of trees for fuel for the owner or his workmen.
 - (e) Cutting of trees for household purposes and agricultural implements.
- Art. 19. The burning of Dwarf Pines (*Pinus montana*) and cutting of their twigs or foliage is prohibited.
- Art. 20. Forest grazing is prohibited in stands less than 9 feet in height and younger than 15 years.
- Art. 21. Grazing in forests subject to rights can be limited to certain areas.
- Art. 22. Forest owners and managers of sawmills and timber yards within a distance of 2 miles from a forest must notify the authorities if destructive insects appear. Forest owners must also notify the authorities if economic pests appear on forest plants.

Partition of Forests.

- Art. 23. Authorization is required for partition of forests and forest lands (by sale, lease, etc.) into lots of less than 75 acres (125 acres in Eastern Provinces). Permission may be granted if such a partition is in the public interest or if justified on economic grounds. This article does not apply to forests less than 75 acres (125 acres in Eastern Provinces) or to family settlements or compulsory sales (to settle debts, etc.).

Protection of Forests.

- Art. 24. Forests and thickets that serve the following functions may be decreed as protection forests:
- (a) Prevention of erosion, rock slips, avalanches, reduction in soil fertility, and the formation of torrents.
 - (b) Protection of river banks and prevention of silting up of springs.
 - (c) Prevention of sand dune formation.
 - (d) Facilitating the defence of the country.
 - (e) Preserving the flora and fauna or demonstrating important scientific principles.
- Art. 25. Government departments, local councils, the Waterway Service, and those whose person or property is endangered are entitled to apply for the listing of any particular forest or forest land as protection forest in conformity with Art. 24, paras. (a), (b), (c). Demands in accordance with Art. 24, paras. (d) and (e) have to be lodged by the War Department and the Ministry of Education respectively.
- Art. 26.
- (a) No permission for clearing protection forests can be granted.
 - (b) Forest grazing and clear fellings may be prohibited in protection forests.
 - (c) In forests declared protection forests in accordance with para. (d) of Art. 24, compulsory fellings can be decreed by the authorities.
 - (d) Compartment rides can be clear felled only if running in directions approved by the authorities.
 - (e) The time limit for replanting can be reduced to one year after the felling has taken place.
- Art. 27. No appeal can be made against Arts. 24-26 on the basis of the provisions of the Water Act.
- Art. 28. Protection forests are exempt from State and Communal taxes.

Authorities.

- Art. 29. The term authorities as used in this Act refers to the 'Prefect' and the 'Governor'.
- Art. 30.
- (a) The Prefect is entrusted with the immediate control of private forests to ensure the observance of the Act.
 - (b) He deals with all questions relating to forests of less than 75 acres (125 acres in Eastern Provinces).
 - (c) He deals with the closing of forests in conformity with Art. 17.
 - (d) He regulates forest grazing in accordance with Art. 21.
 - (e) He orders measures to be taken against insect pests.
 - (f) He supervises reforestation according to Arts. 4-7 and grants exemption from taxation in accordance with Art. 8.
- Art. 31. The Governor deals with all questions arising from the State control of forests over 75 acres (125 acres in Eastern Provinces), grants authority for the partition of forests and decides which shall be protection forests and what management is then to be applied.

Procedure.

- Art. 32. In connexion with the enforcement of this Act the authorities have the right to enter any forest and inspect the necessary documents.

STATE CONTROL OF PRIVATE FORESTS IN POLAND

- Art. 33. All correspondence connected with the enforcement of the Act is forwarded to the forest owners through the local councils.
- Art. 34. There is no right of appeal against the listing of a forest for protection in accordance with Art. 24, para. (d).
- Penalties.*

Penalties.

- Arts. 35-39. The following penalties are imposed against forest owners failing to comply with the provisions of the Act:
- (a) The penalty for illegal felling is a fine twice the value of the felled trees and in addition the forfeiture of timber illegally felled even if it has passed into legal possession of a third person. The fine for illegal felling in a protection forest is four times the value of the felled timber.
 - (b) Clearing without authority—from £5 to £8 per acre.
 - (c) Clearing in protection forests without authority—£16 per acre.
 - (d) Partition of forest without authority—from £1 10s. to £5 per acre.
 - (e) Partition of protected forests without permission—£16 per acre.
 - (f) Failure to replant within prescribed time limit—from £3 to £8 per acre.
 - (g) Illegal forest grazing—2s. 6d. per animal.
 - (h) Removal of litter—ordinary forest—16s.
protection forest—£4.
 - (i) Clear felling compartment rides in military protection forests without authority—£40.
 - (j) Failure to report destructive insects—£8.
 - (k) Neglect of insect control prescribed by authorities—£20.
 - (l) Alternative penalty—imprisonment for six weeks.

THE ENFORCEMENT, ADMINISTRATION AND INFLUENCE OF THE ACT.

Working Plans.

Even before the last great war the larger forests of Poland with but few exceptions were managed according to working plans. However, as a result of the damage caused by army operations during that war the character of the forests was largely changed so that new working plans were required after peace was established. Timber was urgently needed at that time and, as working plans could not be prepared quickly enough, it was decided to authorize the working of forests according to working programmes, irrespective of the forest area. This had an advantage silviculturally as it facilitated the immediate felling of all damaged stands* that were unlikely to improve, these being replaced by new and better plantations.

The programmes usually covered a period of five years but authority was often given for the cutting of the five annual coupes in two or three years in order to provide money for the restoration of ruined estates. In the case of smaller forests, programmes were approved for ten years and the coupes could be made in the first five or even three years; this practice was continued for smaller forests as the larger coupes attracted more important timber firms. In some cases, however, a working plan was prepared and approved immediately after the felling authorized by the programme had been carried out. This generally applied to larger forests. Obviously this was a concession to the owner, for if the programme fellings were completed in three years instead of five and were followed immediately by the cuttings prescribed in the working plan, then the timber on two extra annual coupes had been extracted. On the other hand the working plan came into force two years earlier, which was in the national interest, as its more precise prescriptions then ensured management on a rational basis from an earlier date.

A working plan or programme could be prepared by the owner himself if he possessed the requisite knowledge. In the case of large forests managed by trained foresters, the latter sometimes drew up plans, but as a rule the drafting of a plan was entrusted to private specialists in forest management who had their own offices and the necessary staff. Forestry Commissars, Provincial Forestry Officers and all other members of the State Control Service were strictly forbidden to prepare plans for private owners. But as it was the Forestry Commissar who examined the plan on the spot and whose report served as a basis for its approval, rejection or amendment by the Provincial Forestry Officer, the private forester entrusted with the preparation of a plan usually consulted the Forestry Commissar and the Provincial Forestry Officer in order to learn the approved system of management before starting on his work, though he was free to reject the advice given. Complicated plans that made control difficult were, however, never approved.

The cost of a programme or plan for a managed forest that did not require a new survey or demarcation of compartments was from 1s. to 2s. per acre, although if a new survey and division of the forest was necessary the price might be doubled, as the accurate surveying practised in Poland was expensive. The cost at 1s. to 2s. per acre would average 1 to 2 per cent. of the value of the ten-year fellings prescribed by the plan, exceeding 2 per cent. where the forests were poor and logging conditions difficult, and amounting to $\frac{1}{2}$ per cent. or less in a forest with a valuable stocking situated in the western part of the county where timber prices were high. Where coupes were sold standing, the cost of the plan would form a higher percentage of the returns than if the wood had been logged and sawn by the estate staff.

Following the primary consideration of sustained yield, the next most important condition embodied in the plan was that natural forest types should be maintained on the appropriate sites defined by scientific research.

Although the Act stipulated a three-year time limit for replanting annual coupes, a clause was usually inserted in the document by the Provincial Forestry Officer, by which he approved the plan prescribing reforestation in the spring following the felling.

* Shrapnel was of minor importance compared with the damage inflicted by poorly fed horses which browsed the bark in forests where transport and cavalry units were camped.

Where management was based on an area method of yield control, it was the custom to make annual coupes equi-productive by allowing for density. If necessary this could be approved by a special amendment during the ten-year period covered by the plan.

Apart from thinnings of stands up to 20 years, removal of dead trees, windfalls and cutting of trees for fuel and household needs of the owner and estate, the removal of all other trees—outside annual clear fellings prescribed by the plan—required the approval of the local Forestry Commissar. This applied to partial fellings even if prescribed by the plan, as for instance seeding and other fellings in Beech stands, as well as to the removal of such species as Alder, Aspen and Birch which formed a low proportion of a mixture and could not be retained to the end of the prescribed rotation. For this purpose two lists of the trees marked for removal were prepared. Each list gave the number (stamped at B.H. and on the tree collar) of each tree marked, together with D.B.H., height and volume. After approval one list was returned to the owner and later in the summer the Commissar inspected the forest to check the catalogue and make sure that no unmarked tree had been felled. If, however, the Commissar trusted the owner and the manager he usually sanctioned the partial felling without the presentation of a list, but the trees had still to be marked. This was an important concession for much time and work was thus saved.

If the Provincial Forestry Officer believed a forest to be well managed and if he was sure that the forest nurseries were well cared for and adequately stocked, he usually permitted larger coupes in forests that had a high proportion of mature stands. Furthermore, if a good site suitable for a valuable species was occupied by a less valuable crop, the Provincial Forestry Officer would approve a lower rotation if he was confident that proper reforestation of the coupes was guaranteed. For example, in the south-east of the country Hornbeam had colonized the fertile soils previously occupied by Oak and it provided good returns if felled at 40 years and sold as fuel. Thus with a short rotation the owner benefited by early returns and regeneration with Oak was in the national interest.

To summarize all these considerations, the purpose was to make the provisions of the plan strict, but if the forest management was efficient then more liberal prescriptions were often approved. Furthermore, where strict provisions were in force, concessions were sometimes allowed if the stands were carefully tended and the annual coupes efficiently regenerated: such concessions, however, had always to be in conformity with rational utilization.

Partition of Forests.

The State being opposed to the partition of forests, the Act for State Control of Private Forests contains a provision (Art. 23) forbidding partition in lots smaller than 75 acres (125 acres in Eastern Provinces) without authorization. The reasons for the State's adopting such a policy were as follows: (a) the annual increment of smaller forests was lower than that of larger ones*; (b) a partitioned forest provided no timber for commercial use as rational management is impossible on small areas; (c) partitioned forests were exempt from State control as the cardinal provisions of the Act did not apply to forests of less than 25 acres in area, provided they were not subject to rights or listed as protection forests. However, when pressed by peasants who needed a permanent source of firewood and timber for household purposes, the Government has occasionally authorized the partition of forests.

During later years an attempt was made to solve the problem of rational management of a partitioned forest by granting permits for partition only on condition that the prospective owners formed a co-operative society, and worked the whole forest according to a single programme or working plan. The members of such a forest co-operative society did not own individual forest lots but only a share in the annual yield. Forests were no longer split up into small holdings mainly to provide pasture. They remained under the provisions of the Act with the result that a system of management ensuring sustained yield could be enforced and stands throughout a single unit were preserved rather than degenerating into poor coppice.

The Role of the Forestry Commissar.

In the densely forested Eastern Provinces a Commissar controlled the private forests of a single county while in the poorly wooded provinces several counties would be under his supervision. Control in one county involved an area of 125,000 to 250,000 acres of private forests situated within a radius of 30 to 50 miles from his office. When several counties were under one Commissar the total area of private forests involved was only 50,000 to 100,000 acres comprising many small scattered blocks, which necessitated extensive travel.

The Forestry Commissar's chief tasks were to enforce the Act for the State Control of Private Forests on the spot, to ensure that the prescriptions of the working plan or programme were carried out by the owners, to promote the afforestation of waste land, and finally to encourage forestry in general. He also had to prevent illegal utilization of the forests. He was therefore informed by the Prefect, who obtained the information from the local State police, of all fellings taking place throughout the county. Each felling was then checked and if the owner had not obtained authorization to fell, the Commissar issued a decree closing the forest. Illegal fellings were further discouraged by the difficulty of marketing the material, because timber merchants would not buy timber felled without permit as their purchase was sure to be confiscated if the Forestry Commissar was informed of the deal. The Commissar watched especially the management of forests where the owners were known to be in financial difficulties or living above their means, for in such cases the temptation to fell without the necessary authorization would be greater.

In order to control the management of private forests the Forestry Commissar had the right to enter them at any time. When a visit to a forest was necessary,† as in cases dealing with clearings, plans, programmes, partial fellings, or the removal of seedbearers, then the Commissar drew up a report on the situation, immediately after the inspection was completed. If the forest was subject to rights, the right holders could also accompany the owner or his agent and the Commissar on the tour of inspection. Then if all parties approved of the report

* See page 1.

† If the owner requested an inspection visit then he had to pay the Commissar's travelling expenses into the Treasury.

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drawn by the Commissar it was signed and witnessed. On the other hand the owner or his agent could refuse to sign if he considered the presentation of the case unfair, or alternatively he could sign the document adding that he would lodge a protest. Similarly the right holders could appeal against any section of the report which they considered would unfavourably affect their interests. The final report served as a basis for the decision which was made by the Commissar or more often by the Provincial Forestry Officer.

Where clearings were contemplated the Commissar and the Land Reform Officer inspected the area together. The Land Reform Officer then had to decide whether the forest land was really needed in the interest of the land reform and furthermore if the cleared area was suitable for agriculture, whilst the Commissar made sure that the deforestation would not result in erosion, deterioration of the land, or serious reduction in the local timber and fuel supply.

During the winter months the Commissar's main task was to keep check on fellings to ensure that they were in conformity with the prescriptions of the plan or programme, but for the rest of the year his work was more varied. In the spring and early summer he controlled afforestation, thinnings and nursery work, being also concerned with the peeling of softwood stumps and the removal of all unbarked softwood timber and cordwood from the forest by March 15th each year as a preventive measure against insect epidemics. Then later in the summer the Commissar investigated new programmes and plans, possible amendments and partial fellings marked for the next felling season.

In connexion with the Commissar's decisions, orders and instructions, protests could be lodged with the Governor of the Province for examination by the Provincial Forestry Officer.

The Role of the Provincial Forestry Officer.

The Provincial Forestry Officer controlled all the private forests of a Province through his staff of Forestry Commissars residing in county towns.

In the poorly forested Western Provinces a Provincial Forestry Officer usually had under his control approximately 250,000 acres of private forest land with two or three Forestry Commissars to assist him. The Eastern Provinces were, however, more heavily wooded, having an area of anything up to 2,200,000 acres of forests, and in such cases there was a larger staff of up to eight county Forestry Commissars.

The main task of the Provincial Forestry Officer was to ensure that private forests were managed by methods guaranteeing the production of high-grade timber on a sustained-yield basis and the preservation of the natural type of forests.

As it was the Provincial Forestry Officer who approved the working plans and programmes for all private forests of the province, he was able to ensure the main objects of management by suggesting amendments to plans or programmes or rejecting them entirely if they did not give sufficient guarantee of a sustained yield of high-grade timber together with adequate protection of the natural forest types. On the other hand, specialists who prepared the plans for the owners were free to prescribe the species, silvicultural system and method of management to be adopted on condition that the prescriptions complied with the three basic principles mentioned above.

The Provincial Forestry Officer also helped to frame the general forest policy of the State towards private forests by drawing up reports for the Section of State Control of Private Forests of the Ministry of Agriculture, on conditions, requirements and best systems of management for private forests in his province. Furthermore, he attended conferences held by this Section for the discussion of general and current problems relating to the State control of private forests. Initiative came both from the Ministerial Forestry Officers forming the staff of the Section and from the Provincial Forestry Officers. Thus after the severe frost damage affecting Beech stands in south-eastern Poland in 1928-29, the local Provincial Forestry Officer suggested that extensive emergency fellings, considerably in excess of those prescribed by the plans, should be authorized to enable the owners to market the largest possible proportion of the Beech as commercial timber before decay lowered the grade to the category of firewood.

Reports of Provincial Forestry Officers, proceedings of conferences at which the former met the Ministerial Forestry Officers, reports of the latter on their tours of inspection of private forests, and finally scientific forestry research served as a basis on which the Section worked out instructions and directives for the Provincial Forestry Officers.

The Provincial Forestry Officer was in close touch with the Governor of the province and with the Land Reform Officer. The latter sometimes claimed the clearance of large forest areas in the interests of agrarian reform, and the Provincial Forestry Officer would usually state his case for the retention of the forest as opposed to clearance, particularly if he administered a poorly wooded province. In such cases the Governor made the final decision, often deciding in favour of the clearing, for the general policy of the Government was to raise the economic status of the peasantry by increasing their holdings. This resulted in a change-over to agriculture on many excellent Oak sites.

The rational utilization of large forests, with a high production of commercial timber for export, particularly interested the Provincial Forestry Officer and he visited such forests regularly. On such an occasion it was the custom for the manager to discuss all questions of management with the Provincial Forestry Officer, even if they did not require official sanction, for the Officer visited many forests and had a wide experience of all problems.

Once a year, usually at the end of the summer, a conference of forest owners or managers was held in the county town under the chairmanship of the Provincial Forestry Officer. At such meetings reports on afforestation were read by all owners, and weeding, thinning and nursery problems were discussed. These conferences provided a great stimulus to owners and managers to run their forests on the best possible system of management.

Finally, the Provincial Forestry Officer periodically reviewed the activities of the Forestry Commissars residing in the counties of his province and also examined protests lodged against their decisions and activities.

STATE CONTROL OF PRIVATE FORESTS IN POLAND

The Role of the Ministerial Forestry Officers.

The Section for State Control of Private Forests of the Ministry of Agriculture had a staff composed of a Chief Officer and six Ministerial Forestry Officers appointed by the Minister of Agriculture from university-trained foresters with wide experience and from members of forestry faculties.

The main task of the Ministerial Officers was to work out a general outline of the State policy in regard to private forests as well as to prepare instructions for Provincial Forestry Officers on the methods of management of private forests and on all other questions dealing with the State control of private forests. Reports from Provincial Forestry Officers, proceedings of conferences held at the Section, the experience gained by Ministerial Officers on their tours of private forests, and the results of scientific forestry research, as well as suggestions made by the Union of Private Forest Owners served as a basis for the working out of the general State policy in regard to private forests. In addition the Ministerial Officers supervised the activities of all members of the State Control Service and especially those of the Provincial Forestry Officers. The Section was responsible for enforcing the Act for the State Control of Private Forests and for the activities of all members of the Service. Protests lodged against Provincial Forestry Officers were also examined by Ministerial Officers, who actually visited the forest before making a decision if the question was one of major importance.

Decisions of the Section for State Control of Private Forests were issued in the name of and signed by the Minister of Agriculture, who was finally responsible for such control.

The Forest Owners' Attitude towards State Control.

The owners of large forests were not opposed to the Act of 1932, but owners of smaller estates were hostile to State control. The reasons for this difference in attitude were perfectly natural, for owners of large forests were 'forest minded' and with few exceptions had managed their forests on a sustained-yield basis long before the last war. Furthermore they and their managers (usually university graduates) were always on the best of terms with Officers of the State Control Service and with higher State officials, and never failed to comply with the provisions of the Act or the formalities it imposed. Thus it was quite out of the question for an owner to order his manager to execute fellings not prescribed in the approved plan.

On the other hand the owners of smaller forests (400-1,200 acres) were hostile to the Act and towards the Forestry Commissar enforcing it, for they had no 'forest sense' and regarded their stands only as a source of revenue. Thus they were accustomed to fell, with no regard to sustained yield, merely to cover unexpected expenses, subsequently relying on natural regeneration to restock the felled area. Such owners could not afford to keep a trained forester and they themselves lacked the technical knowledge required to establish and tend plantations, so that they rarely reinvested money in their forests. Quite apart from the principles of management imposed by the Act, these owners also resented the clause making plans or programmes compulsory in all cases, for this involved additional expense.

The Forestry Commissar had therefore to be exceedingly tactful in enforcing the Act, but even so, repeated and wilful offences against its provisions had to be punished by the imposition of a heavy fine. This made it quite clear that it did not pay in the long run to fight against the Commissar and gradually the attitude of the small owner became more reconciled toward State control.

A third class of owners with forests under 400 acres was mostly indifferent to the Act, for its provisions had little effect on such forests which were mainly managed to supply timber and firewood for use on the estate.

In the end, however, all forest owners, whatever the extent of their property, accepted the dictates of the Act for the State Control of Private Forests whether in the first instance they resented its clauses or were merely indifferent to its provisions.

Conclusion.

The Act for the State Control of Private Forests of 1932 adequately ensured rational management of such forests, in particular by preserving the natural forest types of Poland, and by protecting the remaining 'forest capital' or growing stock by limiting the annual cut to the current annual increment or 'interest'.

Two main factors contributed to this success, firstly the stringent nature of the Act itself and secondly the tactful manner in which it was enforced. Officers of the State Control Service always adopted a persuasive attitude in the first place, but they were backed by strong power if compulsion was necessary.

Thus the nature of the provisions and method of enforcement ensured a permanent supply of timber for export and an improved growing stock by efficient regeneration, tending and thinning. The Polish Act of 1932 was therefore certainly a success and it did not take long for its beneficial influence on the private forests of Poland to become apparent.

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ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

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growth and depletion from other causes, the merchantable timber on company limits represents, at present cutting rates, a pulpwood supply of approximately 85 years.

Economic yields of pulpwood are obtainable in 100 years throughout the region. Assuming a rotation age of 100 years, the present merchantable stands represent an annual wood increment of about 9.4 cu. ft. per acre. However, investigations have shown that yields of 20 cu. ft. per acre per year, and more, may follow stand disturbance by selective cutting or budworm infestation. Age-class distribution is favourable, 30 per cent. of the pulpwood holdings being in younger classes, and residual stands are often left after logging. Regeneration also appears to be fairly satisfactory [cf. *For. Abs.* 4 (24)]. Security of tenure of timber limits is discussed briefly on the basis of present and future requirements.

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cu. ft., and the total for all other uses to 45.4 million cu. ft. Estimates for 1940 give the annual growth as 950 million cu. ft., mortality as 300 million cu. ft., and pulpwood as 50 million cu. ft., leaving available some 600 million cu. ft. for all other drain, which would be sufficient to cover a 75-per-cent. increase in the lumber cut and a 35-per-cent. increase in all other uses. These estimates are for the State as a whole; in South Georgia the drain has probably exceeded growth during 1940 and 1941. Consumption by the newly developed pulpwood industries is lower than is commonly believed and the companies are fostering sound forestry practice among forest owners. Two of the large mills now obtain more than half their wood from salvage and selective cuttings.

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Notes on the size, utilization, protection, and condition of the forests and on the Turkish State Forest Service.

09.7 (67.1): 09.4. HESKE, F. Waldland Kamerun. [The [French] Cameroons, a forest country.] *Dtsch. Holz-Anz.* No. 106, 1940. [G.] Abstr. in *Holz* 4, 1941 (38). [G.] P.R.

A review of forests and forest exploitation in the French Cameroons. In 1937 about 70,000 cu. m. of timber was exported, of which 34 per cent. (by weight) was *Khaya ivorensis*, 20 per cent. *Entandrophragma macrophyllum* and *E. cylindricum*, 10 per cent. *Triplachton scleroxylon*, 6 per cent. *Chlorophora excelsa*, and 2-3 per cent. *Lophira procera*. Exploitation is mostly

restricted to forests in the immediate neighbourhood of roads, railways and waterways, and is normally confined to the valuable commercial timbers.

09.7 (68). ECKBO, N. B. **Forests and forest products.** The Associated Scientific and Technical Societies of South Africa, Johannesburg. 1941. pp. 17. P.R.

A lecture on the significance of forests in South African national economy, including statistics on forest area and output, and notes on utilization.

09.7 (87). [GONZALEZ VALE, M.] **Venezuela: forest resources.** *Chron. bot.* 7, 1942 (37-8). O.B.D.

The area of Venezuela is 912,000 sq. km., of which about half is under forest. Three major forest types are recognized:—(i) xerophilous or dry woods, typical of the low and dry regions; (ii) deciduous or summer woods, which may be considered as transitional between the former and type (iii), pluvial woods, which are typical tropical forests representing the optimum of vegetation in the tropics. Species yielding commercial timber include *Swietenia candollei*, *Cedrela mexicana*, *Hura crepitans*, *Cordia gerascanthus*, *Trichilia spondioides*, *Terminalia hibraria*, *Aspidosperma vargasii*, *Guaiacum officinale*, *Bulnesia arborea*, *Tecoma serratifolia*, *T. pentaphylla*, *Samanea saman*, *Casearia praecox*, *Dimorphandra excelsa*, and *Nectandra rodioei*. Tannin and dyestuffs are yielded by *Caesalpinia coriaria*, *Haematoxylon campechianum* and Mangroves (*Rhizophora*, *Conocarpus* and *Avicennia*). Kapok by *Ceiba pentandra*, rubber by *Hevea* and *Micrandra*, balata by *Mimusops elata*, tonka beans by *Coumarouna odorata*, oil or balsam of copaiba by *Copaifera officinalis* and *C. langsdorffii*, balsam by *Toluifera balsamum* and cuspa by *Cusparia febrifuga*. The forest industry is in its infancy and its contribution to Venezuelan economy is as yet insignificant.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.2. Climate and Microclimate

11.22. GEIGER, R. Das Standortsklima in Altholz-nähe. [The local climate in the neighbourhood of old stands.] *Mitt. H.-Göring-Akad. dtsh. Forstwiss.* 1, 1941 (148-72). [G.] Abstr. in *Forstarchiv* 17, 1941 (316-7). [G.]

Temperature, precipitation, and relative humidity were measured in 6 circular openings varying between 12 and 87 m. in diameter. (i) *At the centre of the openings*.—The least rain fell in the smallest cutting, as the surrounding tree crowns intercepted part of the rain even when it did not fall very obliquely. Most rain fell in the 38-m. opening, as the marginal trees were too far away to effect interception while the shelter from wind had the effect that 5 per cent. more rain was received than in the open; in the 87-m. opening this gain was only 2 per cent. The temperature of the air layer next to the ground agreed within 1° C. with that of the old stand so long as the ratio of diameter of opening to stand height (D:H) was below 0.5. With increasing size of opening the midday temperature at the centre rose steeply and at D:H between 1.5 and 2 was more than 5° C. higher than in the old stand; in yet larger cuttings, however, the temperature again decreased, and the 38-m. opening was the warmest of all during the day. The relative humidity increased continuously with size of opening; the greatest differences were those between open ground and the old stand in the morning and evening. Open ground was already

affected by the daytime fall of humidity when the old stand was still as humid as in the night. The danger of night frost increased with size of opening, and was greatest at the centre of the opening. (ii) *Towards the margin of the openings*.—The night temperature decreased by about 1° C. per 7 m. distance from the old stand outwards. The southern margin of the old stand was colder than its northern margin and the daily course of temperature was more extreme at the southern margin, presumably due to greater exposure. (iii) *At the margin of the old stand* there was not a transitional climate but a special microclimate. In the morning the eastern margins were warmest, and the warmest zone shifted with the course of the sun through the southern to the western margins. The zone of the lowest relative humidity of the air layer next to the ground also shifted in the same manner throughout the day. The highest average relative humidity on a clear, sunny day was at the northern margins of the stand (southern margin of the opening). However, the least change of exposure eastwards meant a more unfavourable climate, but the north-eastern margins had the second lowest mean value for relative humidity and the eastern margins were the driest. On the other hand, the afternoon sun had a marked drying effect on the north-western margins, but as high humidity was maintained considerably longer into the morning, the mean relative humidity was only a little lower than at the northern margins.

11.22 : 11.13 : 11.14 : 91.3. SCHUBERT, J. Nebel und Niederschlagsmenge im Fichtenbestande und im Freien. [Mist and amount of precipitation in Spruce stands and in the open.] *Forstarchiv* 18, 1942 (10-1). [G.]

An analysis of the data collected in a Spruce stand at Carlsberg (Heuscheuer, 720 m. above sea level) during 1875-85 showed that in spring and autumn months precipitation and rainfall were higher in the forest than in the open in months with many misty days, but lower than in the open in those with few misty days.

11.22 : 91.3. NIEDERHOF, C. H., and STAHELIN, R. Climatic conditions within and adjacent to a forest plantation in the Nebraska sandhills. *J. For.* 40, 1942 (244-8). [Rocky Mt. Forest & Range Exp. Sta.]

Climatological data accumulated for 9 years in a 36-year-old Jack Pine plantation and an adjacent open area in the Nebraska sandhills region have shown that:— (1) During the 9 years the average wind movement within the plantation was 28 per cent. of that in the open, and the wind movement continuously decreased with the development of the stand. (2) The average yearly evaporation rate within the plantation was 58 per cent. of that in the open. (3) In the summer, during the hottest part of the day, the plantation has no cooling effect on the atmosphere. Throughout the rest of the year the mean daily, mean minimum and the mean maximum temperatures are lower in the plantation than in the open. (4) The diurnal temperature range during the spring and summer quarters is greater in the plantation. During the fall and winter quarters it is greater in the open. (5) Soil temperatures in the plantation at both 1- and 4-ft. depths are warmer in the winter and cooler in the spring, summer, and fall, than in the open. (6) Due to crown interception the rainfall within the stand was 26 per cent. lower than in the open. As the crowns developed the rate of rainfall interception apparently increased slightly. *From authors' summary.*

11.4. Soil

11.43. Biology of Soil, including Mycorrhiza

11.43.1 : 01.6. KELLEY, A. P. Additions to the literature of mycorrhizae. *Supplement No. 5 to 'The Literature of Mycorrhizae'*. Landenberg, Pa. Jan. 1, 1942. pp. 7.

A current bibliography with abstracts [cf. *For. Abs.* 3 (20)].

11.43.1 : 12.25. RAYNER, M. C., and LEVISOHN, I. The mycorrhizal habit in relation to forestry. IV. Studies on mycorrhizal response in *Pinus* and other conifers. *Forestry* 15, 1941 (1-36).

(1) The paper gives an account of mycorrhizal and pseudomycorrhizal association in a number of conifers, observed during 10 years' intensive study of experimental sowings and plantings in an afforestation area in south-western England. The species receiving special attention are Scots Pine, Corsican Pine, Lodgepole Pine, Sitka Spruce, Norway Spruce, and Lawson's Cypress. (2) One fungus species, *Boletus bovinus*, is mainly responsible for mycorrhiza formation in Pines in the afforestation area. It has been isolated from mycorrhizas of Scots Pine and Corsican Pine and studied in pure culture on various synthetic media. Another mycorrhiza-former, and certain soil fungi that attack roots and mycorrhizas (forming pseudo-

mycorrhizal associations) have also been isolated and studied in pure culture. (3) Evidence is presented that the establishment and maintenance of correct mycorrhizal equipment in the conifers named is a formal condition for normal and healthy growth under the soil conditions described. (4) Soil inoculation with mycorrhiza-formers in pure culture or in humus has made evident the delicacy of response in mycorrhizal activities, and the sensitiveness with which mycorrhizal structure reacts to edaphic changes. (5) The bearing of these observations on the mycotrophic habit in trees and their significance in ecological relationships as a whole is discussed. *Authors' summary.*

11.47. Maintenance of Favourable Soil Conditions

11.47.13 : 12.25. JESSEN, W. Die Wirkung von Rohphosphat auf das Wachstum der Holzarten in sauren Waldböden. [The effect of raw phosphate on the growth of tree species in acid forest soils.] *Bodenk. PflErnähr.* 25, 1941 (31-4). [G.] [Institut für Forstliche Bodenkunde der Universität Göttingen in Hann. Münden.] H.S.B.

The suitability of raw phosphate as a fertilizer for acid soils, demonstrated in previous trials with Larch [*For. Abs.* 1 (231)], was confirmed by fresh tests with Scots Pine. Using unlimed soil, the effect of the raw ('Algier') phosphate on dry weight and P_2O_5 uptake of the seedlings was equal to that of superphosphate or basic (Thomas) phosphate, but when combined with liming it was less effective than the two latter.

11.47.13 : 12.26-8. MELVIN, J. K., and MCCOMB, A. L. Response of American Elm to loose and briquette fertilization in the greenhouse. *J. For.* 40, 1942 (49-51). [Iowa State College.]

Eight fertilizer treatments, four loose and four in the form of briquettes, were applied to seedling American Elms growing in the greenhouse on an acid infertile clay subsoil of the Lindley series. At the end of five months, results for the loose treatments showed high significant responses to superphosphate used alone and to a combination of superphosphate plus ammonium sulphate, the latter being significantly greater than the former. No responses were obtained with ground rock phosphate or ammonium sulphate used alone in loose form, nor with any of the briquette treatments, apparently due largely to the failure of the roots to reach the briquettes. *From authors' summary.*

11.47.13 : 23.22. ALBERT, R. Untersuchungen über die Tiefenwirkung des Vollumbruches und der Basaltdüngung. [Investigations on the effect of complete ploughing and basalt fertilizing at various depths in the soil.] *Forstarchiv* 16, 1940 (231-2). [G.] R.M.I.

Data are given on the distribution of bases, acids, Ca, K, Na, and P_2O_5 at various depths up to 50 cm. in waste land, land ploughed but unfertilized, and land ploughed and fertilized with basalt grit. The ploughed but unfertilized land was poorer in all the constituents named except P_2O_5 . All constituents were much increased by the fertilizer treatment.

11.48. Soil Classes according to their Basic Material

11.48.2 (43.1-5) : 64. WITTICH, W. Natur und Ertragsfähigkeit der Sandböden im Gebiete des norddeutschen Diluviums. [Nature and yield capacity

of the sandy soils in the North German diluvial region.] *Z. Forst- u. Jagdw.* 74, 1942 (1-42). [G.g.]

It is shown that the forest productivity of these soils is very largely determined by the silicate content of the basic material. Coarse-grained sands and gravels generally have a high content of valuable silicates and are capable of bearing fine stands of broadleaved trees as well as of Scots Pine.

11.6. Hydrographical Conditions. Water and Soil Conservation

11.62.11 : 60 (54). GORRIE, R. M. Soil erosion and the cultivator's responsibility. *Repr. from Indian Farming* 1 (5), 1940 (229-33). Manager of Publications, Delhi. 1940.

A brief account of some of the problems in erosion-control work in India and of measures that are being taken to improve conditions, including closure of over-grazed grassland, the establishment of shelterbelts on a co-operative basis, reforestation, contour trenching, &c.

12.1. General Botany

12.11. Physiology. Reproduction. Growth

12.11.1. Plant Constituents

12.11.11 : 12.14.5 : 12.25 : 33.32. ORLOVA, I. M., and NIKITIN, N. I. The chemical composition of Pine needles and processes for the production of needle fibres. *Lesokhim. Prom.* 2 (9), 1939 (31-6); *Chem. Zentr.* 1940, I, 1123-4. *Chem. Abs.* 35 (7185). P.R.

12.11.11 : 12.14.8. WACEK, A. VON, and SCHÖN, A. Untersuchungen zur Frage der Zusammensetzung von Baumrinden. [Research on the problem of the composition of tree barks.] *Holz* 4, 1941 (18-26). [G.g.] [Chemisches Univ.-Laboratorium, Wien.] P.R.

Tree bark can be pulped by the nitric acid processes, notably Kürschner's process, in which alcoholic nitric acid is used, whereas other processes as usually employed in the pulping of wood are unsuitable. The separated fibre, of which a yield of 21.5 per cent. was obtained from Scots Pine bark, was of much the same kind as wood cellulose, and undoubtedly a substance consisting chiefly of glucose. The non-hydrolysable part of Spruce bark, of which about 20 per cent. was obtained by the usual acid pulping methods, is shown to have a structure which appears to be at least partly similar to that of lignin from wood.

12.11.11 : 12.14.8 : 12.25. SHARKOV, V. I. The chemical composition of wood bark. X. Lignin substances in Spruce and Fir bast. *Lesokhim. Prom.* 2 (8), 1939 (11-6); *Chem. Zentr.* 1940, I, 399. *Chem. Abs.* 35 (6443). P.R.

12.11.11 : 12.14.8 : 12.25 : 31.3. SHARKOV, V. I., and KALNINA, V. N. The chemical composition of wood bark. XI. Lignin from Pine bark. *Lesokhim. Prom.* 2 (9), 1939 (25-31); *Chem. Zentr.* 1940, I, 1049-50. *Chem. Abs.* 35 (7184-5). P.R.

12.11.2. Propagation. Growth. Development

12.11.21 : 12.25. ALENCAR, E. Microsporogénese en *Araucaria angustifolia* (Bertoloni) O. Ktze. [Microsporogenesis in *Araucaria angustifolia* (Bertoloni) O. Ktze.] *Ceres, Escola Sup. Agr. e Vet. Vicosa, Minas Gerais* 2, 1941 (444-58). [Port.] *Pl. Sci. Lit.* 14 (26), (6).

12.11.21 : 12.26-8 : 12.13. SWAMY, B. G. L. Contributions to the life-history of *Bignonia megapota mica*. *J. Indian bot. Soc.* 20, 1941 (299-305). L.S.

The reproductive morphology and embryology of *B. megapota mica* are described.

12.11.21 : 12.26-8 : 12.13. PURI, V. The life-history of *Moringa oleifera* Lamk. *J. Indian bot. Soc.* 20, 1941 (263-84). [Meerut College, Meerut.] L.S.

An account is given of the reproductive morphology and embryology of this species.

12.11.22 : 12.11.3 : 12.26-8. JENSEN, H. Flaskympningsmetoden och dess användbarhet inom skogs-trädsförädlingen. [The bottle-grafting method and its utility in forest tree breeding.] *Svensk PappTidn.* 45, 1942 (33-6). [Sw.] P.O.

This method of grafting has been successfully revived for the production of dwarf pot trees for controlled hybridization at the Ekebo laboratory of the Swedish Forest Tree Breeding Association. Fresh, vigorous rootstocks are necessary, and these must have spent the previous year in pots. Grafting is preferably carried out in the greenhouse and during the period of sap rise. The scion should be not more than half as large as the stock. Scions are taken, immediately before use, from older trees of seed-bearing age, being selected from the upper part of the crown where the flower buds are most plentiful; they should be 2-3, or at most 4 years old, 25-40 cm. long above the intended graft, and with branches on all sides, the branches being corrected by cutting if necessary. A shallow tangential slice is taken from the rootstock at the intended union and from the scion at a point about 20 cm. above its base. The cut faces are then bound together and the projecting base of the scion is inserted into a bottle of water. After both the stock and scion have begun to flush a certain amount of union may be assumed (14 days-3 weeks), and about one-third of the branches of the rootstock should be cut back, the remaining two-thirds being removed at further intervals of 14 days each. The projecting base of the scion is then cut back. Wounded surfaces are coated with grafting wax.

The experimental material was mainly Birch, and almost all of the grafts succeeded. As this species is particularly hard to propagate by grafting, the good results are a measure of the probable success to be expected from the use of the bottle method with less difficult species. Some of the Birches began to flower even before full union had taken place and were immediately used for crossings from which good viable seed was obtained.

12.11.22 : 12.25. UNION OF SOUTH AFRICA. Department of Agriculture and Forestry, Division of Forestry. Annual report for the year ended 31st March, 1941. Govt. Printer, Pretoria. 1941. pp. 18.

Investigations into the possibility of raising *Pinus insignis* from cuttings showed that:—(a) cuttings from young trees (2 years old) root more readily than those from older trees, and (b) cuttings from primary lateral branches root more readily than those from secondary branches (p. 13).

12.11.22 : 12.25 : 12.26-8. CANADA. Silvicultural research operations 1940-41. *Silvic. Res. Note Dom. For. Serv.* No. 69, 1941. pp. 29.

The application of hormones to cuttings has given disappointing results in the vegetative propagation of conifers. Factors important to the successful propagation from stem cuttings include (1) season at which

cuttings are collected—this varies with species; (2) propagating conditions—the addition of Alfred peat humus to the propagating sand increased rooting substantially; (3) types of cuttings—those from the full length of medium-sized twigs from the lower part of the tree are superior (p. 8). Depth of planting appears to be important in the propagation of short, vertically-buried stem cuttings of Poplar species and hybrids—3 in. giving best results in experiments (p. 9).

12.11.22 : 12.25 : 12.11.15. THIMANN, K. V., and DELISLE, A. L. Notes on the rooting of some conifers from cuttings. *J. Arnold Arbor.* 23, 1942 (103–9). [Harvard Biological Laboratories, Cambridge, Mass.]

(i) Results on the rooting of cuttings of species of *Abies*, *Tsuga*, *Picea*, *Sequoia*, *Podocarpus*, *Sciadopitys* and *Pinus* are recorded. (ii) Rooting was in all cases much higher in the winter months than in the summer, the optimal auxin treatment was either 100 or 200 mg. per liter (for 24 hours), and in extension of the results previously reported, a number of the species rooted considerably more freely when cuttings were taken from young trees than when taken from older stock. (iii) In only one instance (*Picea omorika*) did a treatment with vitamin B₁ noticeably increase the rooting percentage. (iv) In *Pinus strobus* the individual needle bundles or brachyblasts form roots, particularly in response to auxin treatment, at least as readily as do ordinary cuttings. *Authors' summary.*

12.11.22 : 12.25 : 12.11.15. GRACE, N. H., and FARRAR, J. L. Vegetative propagation of conifers. IX. Effects of chemical treatments and a wax spray on the outdoor propagation of Spruce cuttings. *Canad. J. Res.* 19, Sec. C, 7, 1941 (257–66). [National Research Laboratories, Ottawa.] P.R.

Norway Spruce cuttings were collected at intervals throughout the year, subjected to treatment with talc dusts containing from 5 up to 10,000 p.p.m. of indolyl-acetic acid, and propagated in outdoor frames. In some experiments, indolylacetic acid treatments were included in a series of dusts involving cane sugar, potassium acid phosphate, and organic mercurial disinfectants. Effects of wax coatings of cuttings of Norway and White Spruce and Eastern White Cedar were also considered. Indolylacetic acid treatment failed to have any general beneficial effects on rooting; concentrations of 8,000 and 10,000 p.p.m. were usually injurious. However, treatment of apparently dormant cuttings, taken shortly before emergence of new growth, with 1,000 p.p.m. gave 25 per cent. rooting, as compared to 8 per cent. for the controls, and tended to increase the length of root. Treatments with organic mercury, cane sugar, and potassium acid phosphate increased survival of new growth, and, in combination with indolylacetic acid, increased survival and root lengths.

Talc treatment increased rooting to as much as 70 per cent. for cuttings planted in sand as compared to 25 per cent. for the controls, but had no effect on plantings in a sand/peat mixture. Talc effects were the most marked on cuttings taken before emergence of new growth and when planting was delayed for 24 hours after treatment. Wax application had no effect on dormant Spruce cuttings but was markedly injurious to summer collections. Injurious effects were reduced when wax was used in conjunction with indolylacetic acid treatment. *Authors' summary.*

12.11.3. Heredity. Breeding. Hybridization. Races and Questions of Provenance

12.11.3. SMITH, E. C., and NICHOLS, C. Species hybrids in forest trees. *J. Arnold Arbor.* 22, 1941 (443–54). [Biological Laboratories, Harvard University.]

Chiefly a brief review of the history, aims, and technique of tree breeding. The number of known natural and artificial hybrids and the chromosome numbers of 16 important tree genera are tabulated and notes are appended on the individual genera. A list is also given of artificial crossings made by the authors at the Arnold Arboretum between species of *Betula*, *Populus*, and *Ulmus*. From preliminary indications, *Ulmus wilsoniana* Schneid. × *U. japonica* (Rehd.) Sarg. appears more vigorous and more resistant to insect attack than *U. japonica*, and among the *Populus* hybrids those with *P. maximowiczii* Henry as the female parent seem to be the most promising.

12.11.3 : 12.25. HESS, E. Die autochthonen Föhrenrassen des Wallis. [The indigenous races of *Pinus sylvestris* in the Canton of Wallis.] *Schweiz. Z. Forstw.* 93, 1942 (1–14). [G.]

A grey-barked and a red-barked race are distinguished. The former occupies chiefly the dry slopes of the Rhone valley up to 1,000 m. elevation and is characterized by poor height and diameter growth, the trees rarely exceeding 15 m. in height and 30 cm. d.b.h., strong branchiness, a flat crown, and very narrow heartwood. The growing stock is usually less than 100 cu. m. per ha. The red race is widely distributed at elevations of 1,000–2,000 m. The trees reach a height of 25 m. and a d.b.h. of 60 cm., have clean boles a pointed crown, and the stem contains wide heartwood. The growing stock often exceeds 300 cu. m. per ha. The grey race is fit for firewood only, whereas the red race furnishes good timber.

12.11.3 : 12.26–8. GRAM, K., MUHLE-LARSEN, C., LARSEN, C. S., and WESTERGAARD, M. Contributions to the cytogenetics of forest trees. II. *Alnus* studies. *K. VetHøjsk. Aarsskr.* 1941 (44–58). *Biol. Abs.* 16 (6223).

Alnus glutinosa, *A. incana*, *A. hirsuta*, *A. tenuifolia*, *A. tenuifolia* var. *occidentalis*, *A. rubra*, and *A. cordata* had $2n = 28$ chromosomes. Trees cultivated under the names *A. subcordata*, *A. japonica*, and *A. orientalis* had $2n = 42$, and in one individual of *A. subcordata* $2n = 56$. Meiosis was regular in the diploids, very irregular in the triploids, and regular—apart from the formation of some few tetrasomes—in the tetraploid *A. subcordata*. The triploids are regarded as hybrids between diploid and tetraploid species, and triploids cultivated in various botanical gardens under species names are evidently spontaneous hybrids grown under the name of the mother tree. According to other authors, *A. japonica* and forms of *A. glutinosa* are also tetraploid, as is *A. subcordata* × *A. glutinosa* (*A. spaethii*). Experimentally produced hybrids are listed.

12.11.3 : 12.26–8. GRAVES, A. H. Breeding work toward the development of a timber type of blight-resistant Chestnut: report for 1940. *Bull. Torrey bot. Cl.* 68, 1941 (667–74). [Brooklyn Botanical Garden.] O.B.D.

A progress report.

12.11.3 : 12.26–8. BALDWIN, J. T., and CULP, R. Polyploidy in *Diospyros virginiana* L. *Amer. J. Bot.*

8, 1941 (942-4). [University of Michigan, Ann Arbor.] O.B.D.

Diospyros virginiana, a phenotypically variable species, has two chromosome-number races: $2n = 60$ and 90. The distribution of the races is discussed and their horticultural significance suggested. *D. texana* has a $2n$ -number of 30. *Authors' summary*.

2.11.3 : 12.26-8. MCKAY, J. W. and H. H. Microprogenesis in *Juglans intermedia* Carr. *Abstr. in Amer. J. Bot.* 28 (10), 1941 (4s). [U.S. Horticultural Sta., Beltsville, Md.] O.B.D.

It is concluded from studies of pollen development that the trees investigated are natural hybrids between genetically unlike species, probably *J. nigra* and *J. regia*.

2.11.3 : 12.26-8. DILLEWIJN, C. VAN. Zytologische Studien in der Gattung *Populus* L. [Cytological studies in the genus *Populus* L.] *Genetica* 22, 1940 (131-82). R.M.I.*

A cytological study of meiosis in the pollen of *Populus nigra* L., *P. nigra* var. *italica* Du Roi, $\times$ *P. orabundica* Houtz., $\times$ *P. gelrica* Houtz., $\times$ *P. robusta* Schneid., $\times$ *P. serotina* Hartig, *P. deltoides* Marsh. var. *missouriensis* Henry, and *P. alba* L. [Cf. *For. Abs.* 1 (236-7).]

2.11.3 : 12.26-8. MULLER, C. H. Hybridism, ecotypes, and peripheral race variants in *Quercus*. *Abstr. in Amer. J. Bot.* 28 (10), 1941 (17s). [Bureau of Plant Industry, U.S.D.A.] O.B.D.

The causes of variation in *Quercus* may be sporting, stump sprouting, ecological stress, or the occurrence of races about the periphery of a species' range. The latter, if isolated and distinct, may be the basis of valid species differentiation, but all of the factors serve to multiply the claims for F_1 hybridity far beyond the number of actual hybrids existing in the wild. Heterozygosity resulting from ancient crosses also contributes to the claims for hybridity, but such a population, unless protected from dilution by back-crossing, exhibits merely the intraspecific variability common to many species of *Quercus*.

2.11.3 : 12.26-8. PYATNITSKI, S. S. Neue experimentell erhaltene Hybridformen der Eichen: $\times$ *Quercus miczurinii* und $\times$ *Quercus wyssotzkyi*. [New experimentally produced Oak hybrids: $\times$ *Quercus miczurinii* und $\times$ *Q. wyssotzkyi*.] *C.R. Acad. Sci. U.R.S.S.* 10, 1941 (851-3). [G.] A.P.B.

Botanical descriptions are given of two of the hybrids obtained by the author in previously reported work [cf. *For. Abs.* 1 (138)]; these are $\times$ *Quercus miczurinii* (*Q. macranthera* $\varnothing$ $\times$ *Q. borealis* δ) and $\times$ *Q. wyssotzkyi* (*Q. macranthera* $\varnothing$ $\times$ *Q. robur* δ). Of the first hybrid 15 plants were obtained and of the second over 200 plants. Many of the plants are showing vigorous growth.

12.13. Embryology.

2.13 : 12.25. BUCHHOLZ, J. T. The embryogeny of *Pseudolarix* and *Keteleeria*. *Abstr. in Amer. J. Bot.* 28 (10), 1941 (1-2s). [University of Illinois, Urbana.] O.B.D.

2.13 : 12.25. TAHARA, M. Embryogeny of *Torreya lucifera*. *Bot. Mag., Tokyo* 54, 1940 (469-72). [Jap.e.] L.S.

12.14. Organography. Morphology. Anatomy. Histology

12.14.2 : 12.25. FOURCROY, M. Compléments à l'étude du phénomène de la réduction du nombre des convergents chez *Pinus pinea*. [Supplements to the study of the phenomenon of reduction in the number of convergent bundles in *Pinus pinea*.] *Rev. gén. Bot.* 51, 1939 (257-81). [F.f.] O.B.D.

An anatomical study of the process of reduction in convergent vascular bundles in the hypocotyl.

12.14.3. OGURA, Y. New examples of aerial roots in tropical swamp plants. *Bot. Mag., Tokyo* 54, 1940 (327-37). [E.e.] L.S.

A study of the Mangrove-like aerial roots of *Urandra ammul*, *Glochidion hongkongense*, and *Horsfieldia amklaal*, with particular reference to their anatomy.

12.14.3. OGURA, Y. On the types of abnormal roots in Mangrove and swamp plants. *Bot. Mag., Tokyo* 54, 1940 (389-404). [Jap.e.] L.S.

Suggested classification and nomenclature of the different types of negatively geotropic aerial roots as exemplified in *Horsfieldia amklaal*, *Lumnitzera littoralis*, *Bruguiera*, *Ceriops*, *Taxodium distichum*, *Glyptostrobos pensilis*, *Campostemon schultzei*, *C. philippinensis*, *Xylocarpus granatum*, *Carapa* sp., *Heritiera littoralis*, *Urandra ammul*, *Glochidion hongkongense*, *Sonneratia*, *Avicennia*, *Laguncularia racemosa*, *Jussieuia*, *Ludwigia* and *Sesbania aculeata*.

12.14.4 : 12.25. CROSS, G. L. Apical meristem of *Cunninghamia lanceolata*. *Abstr. in Amer. J. Bot.* 28 (10), 1941 (2s). [University of Oklahoma, Norman.] O.B.D.

12.14.5 : 12.25. MOISEEVA, M. Über die zentralen Harzgänge in den Nadeln der *Pinus sylvestris* L. [On the central resin ducts in the needles of *Pinus sylvestris* L.] *C.R. Acad. Sci. U.R.S.S.* 30, 1941, (854-5). [G.] A.P.B.

Discrepancies in the literature on the number and course of the central resin ducts of Scots Pine needles may be accounted for by differences in the material used in respect of age of tree, illumination, position of needles on tree, etc.

12.14.7 : 12.25 : 12.12. PAULEY, S. A bisexual cone of White Spruce. *J. For.* 40, 1942 (62-3). [Michigan State College.]

A single bisexual cone, on which ovuliferous scales were borne basally and staminate scales terminally, was observed on an open-grown, 18-year-old White Spruce (*Picea glauca*), which also bore numerous normal staminate and ovulate cones.

12.19. Geographical Distribution. Plant Geography and Sociology

12.19 (728.2). LUNDELL, C. L. et al. Botany of the Maya area. *Miscellaneous papers, XIV-XXI. Publ. Carnegie Inst. Wash.* No. 522, 1940. pp. 1-474. *Biol. Abs.* 16 (2393).

Reports on the work of the 1936 Michigan-Carnegie Botanical Expedition to the Maya Area of British Honduras, including studies of distribution, dominance, and floristics. Two distinct regions—the Oligocene Limestone Plateau, with subterranean drainage, and the Mountain Pine Ridge—are described. The former is covered by hardwood forest that is approaching extinction from fires during the exploitation of Mahogany

and Chicle. The Mountain Pine Ridge is mainly granitic and is burnt over annually by hunters, resulting in grassy park lands with local stands of Pine and hardwoods and with a rich herbaceous flora along the streams. Individual taxonomic groups are dealt with by a number of authors.

12.19 (77.4). POTZGER, J. E. *The vegetation of Mackinac Island, Michigan: an ecological survey.* Amer. Midl. Nat. 25, 1941 (298–323). [Butler University, Indianapolis.] L.S.

The paper presents an ecological survey of the vegetation of Mackinac Island, Michigan, bringing quantitative data on soil acidity, distributional and sociological factors operating in the forests, and describing physiological differences in the same coniferous species on the island and the mainland of the lower peninsula. The outer rim of the island is controlled almost entirely by northern coniferous forest, and the central portion is dominated by northern hardwoods. *From author's summary.*

12.19 (79.8) : 09.2. COOPER, W. S. *Vegetation of the Prince William Sound region, Alaska, with a brief excursion into post-Pleistocene climatic history.* Ecol. Monogr. 12, 1942 (1–22). [University of Minnesota.]

The vegetational climax is essentially an extension of that of southeastern Alaska, with certain modifications. On the outer islands the forest is normal for the immediate coast. *Picea sitchensis* dominates, and *Tsuga heterophylla* and *T. mertensiana* are also important. On the mainland shores north and west of the Sound, however, *T. mertensiana* is overwhelmingly preponderant. *P. sitchensis* is comparatively infrequent, and *T. heterophylla* is almost absent. Another difference from the climax of southeastern Alaska lies in the abundant presence of areas of 'tundra', which shows two intergrading phases, *Empetrum* heath and *Carex* bog. Forest, heath, and bog are in fairly stable adjustment with environment, and it seems logical to consider the entire complex as a transitional climax between forest and tundra. The major fiords fall into two classes. In the first the walls are clothed with forest-tundra vegetation essentially like that of the open shores; in the second forest is reduced to small patches, and Alder thicket is the most conspicuous type. The second type is far more under the influence of great glaciers and extensive snow fields, and penetrates deep into high mountain masses. The hypothesis is offered that the 'present' in coastal Alaska is a time of ice expansion on a scale not equalled during many centuries of the past. It is further suggested that the preceding period of contraction was of so great magnitude as to be a major event of middle post-Pleistocene time and that it corresponds with the warm or warm-dry (xerothermic) period. *From author's summary.*

12.19 (95). BRASS, L. J. *The 1938–39 expedition to the Snow Mountains, Netherlands New Guinea.* J. Arnold Arbor. 22, 1941 (271–95, 297–342). [American Museum of Natural History, New York.]

Annotated itinerary of the 1938–39 Archbold Expedition, with a discussion of the major vegetation types encountered and a discussion of their relation to the vegetation types recognized by Lane-Poole and van Steenis.

12.19 : 12.26–8 (41.1–4). FENTON, E. W. *The Oak in Scotland, and two semi-natural Oak woods in the south-east of Scotland.* Forestry 15, 1941 (76–85). [Edinburgh & East of Scotland College of Agriculture.]

Formerly both *Quercus robur* and *Q. sessiliflora* were common in the extensive Oak forests of Scotland, particularly in the valleys of the Southern Uplands up to the 1,000-ft. level. These forests have been largely destroyed by man and now only a few small, isolated examples survive. Of these, a Pedunculate Oak wood and a mixed Oak wood are described.

12.19.1. Regional Floras

12.19.1 (71). *Native trees of Canada.* Bull. Dom. For. Serv. No. 61, revised ed. 1939. pp. v + 210.

This bulletin gives for each species a description of the tree as to size, habit, foliage characteristics, etc., a reference to and generally a sketch map of its natural range, and in some instances a brief note on wood properties and uses. Photographs and drawings illustrate the text.

12.19.1 (71 : 73). ROBINSON, F. B. [Compiler.] *Tabular keys for the identification of the woody plants.* Garrard Press, Champaign. 1941. pp. ix + 156. Biol. Abs. 16 (7759).

Covering 500 trees, shrubs, and creepers of the northern United States and Canada. Keys to both leafless and leafy states are included.

12.19.1 (75.8). DUNCAN, W. H. *Guide to Georgia trees.* University of Georgia Press, Athens. 1941. pp. 63. Biol. Abs. 16 (7758).

12.19.1 (96.9) : 12.26–8. EGLER, F. E. *A key to the common Leguminosae of the Hawaiian Islands based upon characters of fruit and leaf.* The Author, New York State College of Forestry, Syracuse, N.Y. 1940. pp. 42.

12.19.2. Forest Types

12.19.2 (43.7). SIGMOND, J. *Die natürlichen Waldwuchsbezirke des Sudetenlandes.* [The natural forest growth regions of Sudetenland.] Thar. forstl. Jb. 92, 1941 (661–94). [G.]

Twelve growth regions are distinguished and their characteristics described.

12.19.2 (47.4). EICHE, V. *Latvijas mežu geografisks iedalījums.* [The geographical classification of the forests of Latvia.] Mežkopja darbs un zinātne 1/II, 1940 (471–561). [Latv.e.] Abstr. in Forstarchiv 18, 1942 (37–8). [G.]

12.19.2 (494) : 12.26–8. LÜDI, W. *Die Kastanienwälder von Tesserete. Beitrag zur Soziologie der Kastanienwälder am Südhang der Alpen.* [The Spanish Chestnut forests of Tesserete. Contribution to the sociology of the Chestnut forests of the southern slope of the Alps.] Repr. from 'Bericht über das Geobotanische Forschungsinstitut Rübel in Zürich für das Jahr 1940'. 1941. pp. 52–84. [G.g.]

12.19.2 (498) : 12.26–8. GEORGESCU, C. C. *Ceretele ca tip de padure. I.* [Turkey Oak woods as a forest type. I.] Rev. Pădurilor 53, 1941 (444–57). [Rum.g.]

Ecological notes on the *Quercus cerris* woods of Rumania.

12.19.2 (66.9) : 11.4. LAMB, A. F. A. *Different soils make different forests.* Farm & Forest 2, 1941 (144–7).

From the evidence presented, it is concluded that the climax vegetation of Nigeria may be subdivided into formations, which are determined largely by climate, and associations based on changes in soil. The formations suggested are lowland closed high forest, savanna woodland, scrub, and grassland, with corresponding montane variations.

12.19.2 (67.8 : 68.9) : 12.19.3. BURTT, B. D. [edited by JACKSON, C. H. N.] *Some East African vegetation communities.* *J. Ecol.* 30, 1942 (65-146).

A posthumous collation of some of the extensive observations on East African vegetation recorded by B. D. Burtt. The selections are grouped under the major headings:—Miombo woodland (*Isoberlinia/Brachystegia* savanna), thorn savanna (deciduous *Acacia* and *Commiphora* types), deciduous thicket, *Combretum* communities, *Protea/Dombeya* highland grassland, evergreen forest and riverine communities, and termite-mound communities. Appended are a table to show the distribution of species, and a general discussion on distribution.

12.19.2 (729). BEARD, J. S. *Montane vegetation in the Antilles.* *Carib. For.* 3, 1941-42 (61-74). [E.e.span.]

The Northern Range of Trinidad rises to just over 3,000 ft. Four major plant formations can be distinguished:—the lowland forests up to 800 ft.; lower montane evergreen rain forest, 800-2,500 ft.; montane rain forest, 2,500-2,900 ft.; and elfin woodland, 2,900-3,085 ft. Detailed descriptions of structure, life form, and flora are given and correlations attempted with the montane vegetation types of the French Antilles, as described by Stehlé, and of Puerto Rico as described by Gleason and Cook. *From author's summary.*

12.19.2 (76.4). THARP, B. C. *Natural vegetational areas in Texas.* *Abstr. in Amer. J. Bot.* 28 (10), 1941 (15-68). [University of Texas, Austin.] O.B.D.

The vegetational areas recognized include the following types with tree growth:—(i) Longleaf Pine; (ii) Pine/Oak; (iii) Oak/Hickory; (iv) the 'cross timbers' (detached regions of Oak/Hickory); (v) the central igneous (Mesquite/Oak/Hickory); (vi) Live Oak savanna; (vii) Mesquite/Cedar savanna; (viii) submontane and montane forests.

12.19.2 (78.8) : 12.19.3. IVES, R. L. *Atypical sub-alpine environments.* *Ecology* 23, 1942 (89-96).

Two atypical subdivisions of the sub-alpine life zone in the mountain valleys of Colorado are described and probable relations between environmental and biotic conditions are indicated. The new subdivisions are sub-alpine wet meadows and alpine rain forests. The occurrence of the latter appears to be intimately related to the localized and intense rainfall common at the heads of valleys with a largely self-contained convection system. The forests consist of species common in the sub-alpine zone but are 2-5 times as dense as normal; the trees are abnormally high and form a very close canopy; and large numbers of undecayed fallen trees lie among the standing timber. The sites of such forests are almost continually wet but with excellent subsurface drainage in the deep, porous soil. Topographically, the environment is extremely favourable to forest, as there is good shelter from wind and lightning, snow normally buries the trees in winter, and there are warm nocturnal updrafts in summer. The extreme wetness protects the forests from fire and is probably responsible at least in part for the comparative absence of animal life, particularly porcupines and other rodents.

12.19.2 (79.5) : 13.15. WYND, F. L. *The botanical features of the life zones of Crater Lake National Park.* *Amer. Midl. Nat.* 25, 1941 (324-47). [University of Illinois, Urbana.] L.S.

Three of the Merriam life zones—the Hudsonian,

Canadian, and Transition—are recognized. The Hudsonian Zone corresponds to the forest of *Tsuga mertensiana* and *Pinus albicaulis*; the Canadian Zone to the *Pinus contorta* var. *murrayana* forest; and the Transition Zone to the *Pinus ponderosa* forest. *From author's summary.*

12.19.2 (944) : 12.26.8 : 11.4. PIDGEON, I. M. *The ecology of the central coastal area of New South Wales. IV. Forest types on soils from Hawkesbury Sandstone and Wianamatta Shale.* *Proc. Linn. Soc. N.S.W.* 66, 1941 (113-37). [Botany School, University of Sydney.] L.S.

A brief account is given of the distribution of forest types on the soils derived from Hawkesbury Sandstone and Wianamatta Shale in the central coastal area of New South Wales. For reasons discussed in the body of the paper, forests on sandstone are classified as variants of one association: the Mixed *Eucalyptus* Forest; and forests on shale fall into several distinct associations: *E. hemiphloia/E. tereticornis*, *E. saligna/E. pilularis*, *E. viminalis/E. fastigata*, and *E. pauciflora/E. stellulata* Associations.

Data are given which illustrate the remarkable specificity of species of *Eucalyptus* to ecological conditions, in particular to rainfall, altitude, and soil type. The bearing of this phenomenon upon the problem of classifying the forests is discussed. *Author's summary.* [Cf. *For. Abs.* 3 (34).]

12.19.2 : 12.26-8 : 11.62.1. STEENIS, C. G. G. J. VAN. *Kustaanwas en mangrove. [Coastal accretion and Mangroves.] Natuurwet. Tijdschr.* 101, 1941 (82-5). [D.u.e.] [Herbarium van's Lands Plantentuin, Buitenzorg.] L.S.

In a recent publication by J. H. Davis [*For. Abs.* 3 (32)] it appears to have been assumed that Mangroves may lead to coastal accretion and it was suggested that they might possibly be planted to extend the coast and to form islands, also to protect the shores from excessive erosion. The present author, from data in the literature and from his own observations, claims that the reverse is true, i.e., that natural coastal accretion by mud silting is the factor responsible for the development of Mangrove woods and is the primary requirement for the successful growth of spontaneous or planted Mangroves.

12.19.4. Succession

12.19.4 (76.6) : 12.19.2. BURNS, P. Y. *Ecological studies in an eastern Oklahoma flood plain.* *Proc. Okla. Acad. Sci.* 21, 1941 (49-52). L.S.

A flood plain area surrounding a small stream 5 miles east of Tulsa was selected as a typical example of a common community in northeastern Oklahoma. Transects showed that Oak, Hickory, and Walnut were succeeding Elm, Ash, and Hackberry by the stream side, and Persimmon by the prairie edge. From the standpoint of numbers, the American Elm dominated, but the Northern Red Oak attained greater size on the dry and mature sites in the center of the woodland. It was concluded that this community, and others of its type in northeastern Oklahoma, is expanding and maturing along the water courses and gullies as they are cut back, until eventually the Oak/Hickory climax is obtained as a dominant cover. *From author's summary.*

12.19.4 (77.6) : 23.4. NIELSEN, E. L., and MOYLE, J. B. *Forest invasion and succession on the basins of two*

catastrophically drained lakes in northern Minnesota. *Amer. Midl. Nat.* 25, 1941 (564-79). [University of Arkansas, Fayetteville.] L.S.

A study of sites at Bass Lake, St. Louis County, and Sunken Lake, Itasca County, both of which were partially drained during logging operations by the washing out of a section of a moraine that had maintained the former lake level. On the nearly raw and slightly modified glacial soils there is little evidence of a general and orderly process of invasion and succession. The nearest approach to a general pioneer stage on these soils is the extensive growth of *Equisetum hyemale* var. *affine* and *E. arvense*. Most of the deciduous woody species and many herbaceous species are able to invade such soils directly. Coniferous species follow the deciduous and herbaceous species closely on all the glacial soils. The effect of pioneer stages in preparing the soil for the conifers has been slight and appears to have been mainly that of binding the soil and providing some shade for the seedlings. It is suggested that on the sites in question the apparent dominance of non-coniferous species may be due to their capacity for rapid dissemination rather than to soil preferences. On the organic soils of the Sunken Lake area forest invasion has been of three types:—(a) On the loose peat of a drained sphagnum-heath bog Pines, White Spruce and Tamarack have become successfully established, while Alder, Poplars, Willows and herbs have not; (b) drained sedimentary peat has been taken over largely by Aspen; (c) wet sedimentary peat has been colonized by Willows and Alder. Old talus slopes, dry cobble beaches, and well drained coarse gravel have been invaded by White Birch to the exclusion of almost all other woody species. Balsam Poplar is the most successful invader on the well drained inorganic sediments of the former lake bottoms; Jack Pine and Aspen are also locally abundant. Wet inorganic sediments are usually colonized by Willows.

12.19.4 (96.9) : 21.0. EGLER, F. E. *Indigene versus alien in the development of arid Hawaiian vegetation.* *Ecology* 23, 1942 (14-23). [Yale University.]

Evidence strongly favours the view that as the natural successions proceed the present abundant and aggressive alien species, which are mainly of a pioneering character, will at length be largely replaced by indigenous species.

12.2. *Special [Systematic] Botany*

12.21. Fungi

12.21 : 44.3 : 12.26-8. HIRT, R. R., and HOPP, H. *Relation of tube layers to age in sporophores of Fomes ignarius on Aspen.* *Phytopathology* 32, 1942 (176-8). [New York State College of Forestry, Syracuse.]

The results of a 5-year study indicate that sporophores of *F. ignarius* normally form one tube layer in the hymenophore each year, except when growth is restricted by surrounding callus or by other adverse factors.

12.21. HADDOW, W. R. *On the history and diagnosis of Polyporus tomentosus Fries, Polyporus circinatus Fries, and Polyporus dualis Peck.* *Repr. from Trans. Brit. mycol. Soc.* 25, 1941 (180-90).

From the studies here reported it is concluded that two closely similar species—*P. tomentosus* and *P. circinatus*—exist and are common to Europe and America, and that *P. dualis* is identical with *P. circinatus*.

12.21. PUSATERI, S. J. *Life cycle of Polyporus betulinus (Bull.) Fries.* *Abstr. in Amer. J. Bot.* 28 (10), 1941 (55.). [University of Southern California, Los Angeles.] O.B.D.

The species is heterothallic. Pairing of nuclei to form diploid mycelium occurs. Sporophores are formed only where plus and minus strains meet.

12.26-8. Dicotyledons

12.26-8. REHDER, A. *New species, varieties and combinations from the collections of the Arnold Arboretum.* *J. Arnold Arbor.* 22, 1941 (569-79). [Arnold Arboretum, Harvard University.]

Changes in nomenclature are:—*Carya (Hicoria) pecan* Engl. & Graebn. becomes *C. illinoensis* (Wangenh.) K. Koch; *Quercus dilatata* Lindl. ex Wallich becomes *Q. floribunda* Wallich; and *Q. sessiliflora* v. *laciniata* Koehne becomes *Q. petraea* Liebl. f. *insecata* (Rehd.).

12.26-8 : 12.29 (54). BOR, N. L. *Some new Indian flowering plants: Gleditsia assamica Bor, Garnotia puchiparensis Bor, and Strobilanthes andamanensis Bor.* *Indian For. Rec. (n.s.) Botany* 2, 1941 (1 + 231-9). [Forest Research Institute, Dehra Dun.]

12.26-8 (95). MERRILL, E. D., and PERRY, L. M. *Plantae Papuanae Archboldianae, VII.* *J. Arnold Arbor.* 22, 1941 (375-88). [Arnold Arboretum, Harvard University.]

The families covered are Vitaceae, Campanulaceae, Lobeliaceae, and Goodeniaceae. Three new tree species are described in the genus *Leea*.

12.26-8 (95). MERRILL, E. D., and PERRY, L. M. *Plantae Papuanae Archboldianae, VIII.* *J. Arnold Arbor.* 22, 1941 (529-42). [Arnold Arboretum, Harvard University.]

Includes species of Anacardiaceae and Corynocarpaceae, with 2 new species and a new variety in *Buchanania*, 1 new species of *Camptosperma*, 3 of *Semecarpus*, and 1 doubtfully placed under *Mangifera*.

12.26-8 (95). SMITH, A. C. *Studies of Papuanian plants, III.* *J. Arnold Arbor.* 22, 1941 (343-74). [Arnold Arboretum, Harvard University.]

Deals with the Guttiferae; 7 new species are described in *Calophyllum*, 12 in *Garcinia*, and 3 in *Pentapthalangium*.

12.26-8 (95). SMITH, A. C. *Studies of Papuanian plants, IV.* *J. Arnold Arbor.* 22, 1941 (497-528). [Arnold Arboretum, Harvard University.]

The families dealt with are Dilleniaceae, Actinidiaceae, and Ochnaceae. Three new species of *Wormia*, 18 of *Saurauia* and 3 of *Schuermansia* are described.

12.26-8 (95). WHITE, C. T. *Some Papuan Myrtaceae.* *J. Arnold Arbor.* 23, 1942 (79-92). [Botanic Gardens, Brisbane.]

Descriptions are included of 3 new species in *Metrosideros*, 2 in *Mearnsia*, and 1 each in *Xanthostemon*, *Tristania*, *Basisperma* (genus also new) and *Rhodomyrtus*. The account contains notes on many other species of Myrtaceae.

12.26-8 (96.1-8) : 12.19.1. KANEHIRA, R., and HATUSIMA, S. *New or noteworthy trees from Micronesia.* XXIII. *Bot. Mag., Tokyo* 54, 1940 (433-7). [E.] L.S.

Including descriptions of *Croton ripense*, *Acalypha ponapensis*, and *Evodia ponapensis*, spp. nov., and fresh records of other species.

12.26-8. CROIZAT, L. The tribe Plukenetinae of the Euphorbiaceae in eastern tropical Asia. *J. Arnold Arbor.* 22, 1941 (417-31). [Arnold Arboretum, Harvard University.]

Including a critical discussion of generic relationships and limits.

12.26-8 (51 : 59). CROIZAT, L. On certain Euphorbiaceae from the tropical Far East. *J. Arnold Arbor.* 23, 1942 (29-54). [Harvard University.]

New species and combinations, new records, and critical notes. Genera dealt with are *Actephila*, *Alchornea*, *Cleistanthus* (including *Paracleisthus*), *Coelodendron* (including *Nephrostylis*), *Croton*, *Dicoelia*, *Epiprinus* (including *Symphyllia*), *Macaranga*, *Phyllanthodendron*, *Phyllanthus*, *Ptychopyxis* (including *Calpigne* and *Podadenia*), *Securinega*, and *Trigonostemon*.

12.26-8. HOWARD, R. A. Studies of the Icacinaceae, II. *Humiranthra*, *Leretia*, *Mappia* and *Nothapodytes*, valid genera of the Icacinaceae. *J. Arnold Arbor.* 23, 1942 (55-78). [Harvard University.]

The genera are redefined and descriptions and distributions of the species given.

12.26-8 (67.9). GOMES DE ABREU LIMA, J. Leguminosae florestais de Moçambique. [Forest Leguminosae of Mozambique.] *Bol. Geral Colón, Lisboa* 16 (182/183; 184), 1940 (40-68; 39-83). [Port.] *Pl. Sci. Lit.* 14 (25), (19).

12.26-8. CROIZAT, L. Identifying Maples in winter. *Amer. Nurseryman* 75 (3, 4), 1942 (5-6, 9; 13-4, 36-7). [Arnold Arboretum.]

12.26-8. (88.1). SANDWICH, N. Y. Contributions to the flora of tropical America: XLVI. The Haiariballis of British Guiana. *Kew Bull.* 1941 (228-32).

The Haiariballi trees of British Guiana comprise two distinct species, *Alexa imperatricis* (R. Schomb.) Baill., and *A. leiopetala* sp. nov., which is described for the first time in the present paper. The former occurs in the North-west District, the Pomeroon District and on the Pakaraima Range, while the latter is frequent in the drier climate of the Cuyuni-Mazaruni-Essequibo River region and occurs more rarely in that of the Demerara River. Both are apparently endemic species.

12.26-8 (95). SMITH, A. C., and BAILEY, I. W. *Brassiantha*, a new genus of Hippocrateaceae from New Guinea. *J. Arnold Arbor.* 22, 1941 (389-94). [Arnold Arboretum, Harvard University.]

Brassiantha pentamera, gen. et sp. nov., is described and figured, with a discussion of its systematic position as evidenced by external morphology and wood structure.

12.26-8. KOBUSKI, C. E. Studies in the Theaceae, VII. The American species of the genus *Cleyera*. *J. Arnold Arbor.* 22, 1941 (395-416). [Arnold Arboretum, Harvard University.]

Key to the species, of which 5 are described as new and several others are transferred from related genera, followed by notes on their characters and distribution.

12.26-8 (75.9). MURRILL, W. A. New Florida Hawthorns. *Castanea* 7, 1942 (19-30). [Florida Agricultural Exp. Sta., Gainesville.]

Twenty new Hawthorns are described.

12.26-8 (7 : 8). KRUKOFF, B. A. Supplementary notes on the American species of *Erythrina* I. *Amer. J. Bot.* 28, 1941 (683-91). [New York Botanical Garden, New York City.] O.B.D.

Consisting chiefly of additional records of distribution. *E. guatemalensis* sp. nov. is described from Guatemala.

12.26-8. KOBUSKI, C. E. Studies in the Theaceae, VIII. A synopsis of the genus *Freziera*. *J. Arnold Arbor.* 22, 1941 (457-96). [Arnold Arboretum, Harvard University.]

Includes a key to the species and notes on their characters and distribution. New species described are *F. smithiana* from Colombia, *F. caloneura* from Bolivia, *F. parva* from Peru, and *F. euryoides* from Colombia.

12.26-8 (81). DUCKE, A. *Lonchocarpus*, subgenus *Phacelanthus* Pittier, in Brazilian Amazonia. *Trop. Woods* No. 69, 1942 (2-7).

It is pointed out that the American species attributed to *Derris* rightly belong under the subgenus *Phacelanthus* of *Lonchocarpus*. The Amazonian species of this subgenus are enumerated and new combinations made to accommodate species transferred from *Derris*.

12.26-8 : 01.2. PIERCE, J. H. The nomenclature of Balsa wood (*Ochroma*). *Trop. Woods* No. 69, 1942 (1-2). [New York Botanical Garden.]

The priority of the specific epithets in the synonyms *Ochroma lagopus* Sw. and *O. pyramidale* (Cav.) Urban is uncertain, and it is considered expedient to maintain the former and more widely known name. Some doubt is cast upon the validity of the species of *Ochroma* distinguished by Rowlee. [Cf. *For. Abs.* 3 (273-7).]

12.26-8 (73). BENSON, L. The Mesquites and Screwbeans of the United States. *Amer. J. Bot.* 28, 1941 (748-54). [University of Arizona, Tucson.] O.B.D.

A revision of the United States species of *Prosopis*, species recognized are *P. juliflora*, with vars. *velutina*, *torreyana* and *glandulosa*, *P. pubescens*, and *P. cinerascens*.

12.26-8. MULLER, C. H. The problem of genera and subgenera in the Oaks. *Chron. bot.* 7, 1942 (12-4). [Div. of Plant Exploration & Introduction, U.S.D.A.] O.B.D.

O. Schwarz's classification of *Quercus* and his segregation of the genus into separate genera and subgenera are severely criticized. The present author recognizes the subgenera *Lepidobalanus* and *Erythrobalanus*, differences between which are enumerated, but is convinced that so far as American Oaks are concerned there is no basis for the generic distinction from *Quercus* of any except *Lithocarpus*, which is barely represented in the American flora.

12.26-8. MURRILL, W. A., and PALMER, E. J. A new Willow from Florida. *J. Arnold Arbor.* 22, 1941 (580-1). [Arnold Arboretum, Harvard University.]

Description of *Salix astatulana* sp. nov., most nearly related to *S. longipes* Shuttleworth.

12.26-8. MERRILL, E. D., and PERRY, L. M. Observations on old world species of *Turpinia* Ventenat. *J. Arnold Arbor.* 22, 1941 (543-55). [Arnold Arboretum, Harvard University.]

A key is provided to the group of species with compound leaves, in which 4 new species and 3 new varieties are published.

13.1. General Zoology

13.15 : 13.2 : 91.1 : 45.12. PETRIDES, G. A. Observations on the relative importance of winter deer browse

species in central New York. *J. Wildlife Management* 5 (4), 1941 (416-22). *Biol. Abs.* 16 (459).

Of the total browsing by northern white-tailed deer (*Odocoileus virginianus borealis*) recorded during the winters of 1938-39 and 1939-40 in the Connecticut Hill State Game Refuge near Ithaca, New York, 46.5 per cent. was on *Acer rubrum*, *A. saccharum*, *Rhus typhina* and *Hamamelis virginiana*, 30.3 per cent. was on *Populus grandidentata*, *P. tremuloides*, *Betula* spp., *Quercus* spp., *Cornus rugosa* and *Acer pennsylvanicum*, and the remaining 23.2 per cent. was on 32 other species. The main preferred species were *Cornus rugosa*, *C. florida*, *Rhus typhina* and *Tilia americana*, while *Acer* spp., *Hamamelis virginiana*, *Quercus* spp., and *Betula* spp., formed the chief staple foods. The chief emergency foods appeared to be *Tsuga canadensis*, *Pinus strobus*, *P. resinosa*, *P. sylvestris*, and *Fagus grandifolia*. Preferred foods made up 21.8 per cent., staples 61.1 per cent., emergency 14.5 per cent., and miscellaneous 2.6 per cent. of the total browsing record.

13.15 : 13.2 : 07.7 : 45.3. KLOET, G. S. Improvements to Burke's trap for wood-boring insects. *Ent. mon. Mag.* 78, 1942 (61-3).

13.15 : 13.2 : 13.14. NOLTE, H.-W. Beiträge zur Biologie und Morphologie der Raubwanze *Troilus luridus* F. [Contributions to the biology and morphology of the predacious bug *Troilus luridus* F.] *Thar. forstl. Jb.* 91, 1940 (202-16). [G.] R.M.I.

13.15 : 13.2 : 45.3. GOBEL, A. R. La diapause chez les Tenthredines. Parties I et II. [The diapause in the Tenthredinidae. Parts I & II.] *Repr. from Canad. J. Res.* 19, Sec. D, 1941 (363-416). [F.f.] [Service d'Entomologie, Ministère des Terres et Forêts, de la Chasse et de la Pêche, Québec.]

Report on a study of the influence of certain factors on the breaking of diapause in the Tenthredinidae, including among others *Diprion polytomum* and *Pristiphora erichsoni*.

13.15 : 13.2 : 45.3 : 12.25. PREBBLE, M. L. The diapause and related phenomena in *Gilpinia polytoma* (Hartig). I. Factors influencing the inception of diapause. II. Factors influencing the breaking of diapause.

2. SILVICULTURE

2 : 12.25. DANNECKER, K. Ursachen des Rückgangs der Weisstanne und waldbauliche Folgerungen. [Causes of the decadence of Silver Fir and silvicultural inferences.] *Cbl. gesamte Forstw.* 67, 1941 (277-90). [G.]

After a discussion of the ecological requirements of Silver Fir, the writer makes another plea to counteract the disappearance of this species from its native habitats in Germany by adopting selection management [cf. *For. Abs.* 3 (119)]. Silver Fir should be grown in mixture with broadleaved trees, notably Beech.

2 : 12.25 : 12.11.3 : 42 : 6 (43.7). HEGER, A. Probleme der Fichtenwirtschaft in Sudetenland und in den Beskiden. [Problems of Spruce management in Sudetenland and in the Beskiden.] *Thar. forstl. Jb.* 92, 1941 (639-60). [G.]

It is argued that the primary task of Spruce management in these regions is to increase the resistance of the stands to snow and storm damage by means of regular

III. Bioclimatic relations. IV. Influence of food and diapause upon reproductive capacity. V. Diapause in relation to epidemiology. *Repr. from Canad. J. Res.* 19, Sec. D, 1941 (295-322, 323-46, 350-62, 417-36, 437-54). [Science Service, Department of Agriculture, Victoria, B.C.]

13.15 : 13.2. GARDNER, J. C. M. Immature stages of Indian Lepidoptera: (2) Noctuidae, Hypsidae. *Indian For. Rec. (n.s.) Entomology* 6, 1941 (253-98). [Forest Research Institute, Dehra Dun.]

13.2. Special [Systematic] Zoology

13.2 : 45.3. DILLON, L. S. and E. S. The tribe Monochamini of the Western Hemisphere. *Sci. Publ. Reading publ. Mus.*, Pa. No. 1, 1941. pp. 135 + plates. P.R.

A monographic treatment, with keys, descriptions and distribution of each species.

13.2 : 13.15. NDERSON, A. W. H. The larva and pupa of *Cylindrocaptus furnissi* Buchanan (Coleoptera, Curculionidae). *Proc. ent. Soc. Wash.* 43, 1941 (152-5). [Bureau of Entomology & Plant Quarantine, U.S.D.A.] L.S.

Descriptions of the larva and pupa of this species and key to mature larvae of the known species of the genus.

13.2 : 45.3 : 12.25. BLACKMAN, M. W. Bark beetles of the genus *Hylastes* Erichson in North America. *Misc. Publ. U.S. Dep. Agric.* No. 417, 1941. pp. 27. [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

A key is provided to the species, including 7 new ones, followed by detailed descriptions of each.

13.2 : 31.43. MUESEBECK, C. F. W. Two new reared species of *Doryctes* (Hymenoptera: Braconidae). *Proc. ent. Soc. Wash.* 43, 1941 (149-52). [Bureau of Entomology & Plant Quarantine, U.S.D.A.] L.S.

Descriptions are given of *D. ambeodonti* sp. nov., reared from *Ambeodontus tristis* in *Dacrydium cupressinum*, the host being said to be the most important beetle attacking houses in New Zealand; and of *D. parvus* sp. nov., reared from various hosts, including *Dinoderus minutus* in bamboo, Bostrichidae in case wood, and *Lyctus*.

improvement fellings and by favouring native against other races of Spruce.

2 : 12.26-8 : 12.11.22 : 31.3 : 33.32 : 4 : 56. VOGELSANG, P. Hybrid Poplars. *Paper Tr. J.* 113 (20), 1941 (38-40). [Dow Chemical Co., Midland, Mich.] P.R.

A brief account is given of the Poplar research programme of the Dow Chemical Co. in Michigan, which includes experimental plantings to determine silvicultural characters and treatment and studies of growth rate, disease and insect resistance, and pulping properties of the wood. Propagation by cuttings is used to maintain the clones. Cuttings are made from first-year wood; those taken from main stem shoots and $\frac{1}{2}$ in. or more in diameter by 12 in. or more in length have proved superior to other types. In some clones, hormone treatment has increased rooting from 84 to 97 per cent., but in others natural root initiation is satisfactory and 99 per cent. or more of the cuttings will survive. Though fresh cuttings can be planted with

good results, better rooting has been obtained from autumn cuttings stored upside-down through the winter in sterile sand kept just moist enough to prevent them either absorbing or losing water and at temperatures slightly above freezing point. Cuttings must be planted while still dormant, and to secure single-stemmed trees they should be buried to leave only the topmost bud above ground. Some of the plantation sites are on abandoned farms with poor, sandy soil and a heavy grass cover infested with harvest mice: on such sites it has been found advisable to plough and cultivate, or poison the mice in the winter before planting. Trees are usually not damaged by mice after the first season. On better soils close planting of the trees may be adopted to shade out grass growth. Poplars produce fast-growing stump sprouts after cutting, and second crops can therefore be obtained from coppice growth. The growth studies made have shown the hybrid Poplars to be far better growers than the native species; height growth in some of the clones has averaged 1 in. per day in the first season and 10 ft. per season in the second and third. Furthermore, the hybrids have done well on land that will not support native growth. Some of the hybrids tried appear to be resistant to attack by the roundheaded Poplar borer, the most serious insect pest of the group. In spite of their rapid growth the wood of the hybrids is comparatively dense and contains a higher percentage of α -cellulose than that of the native Aspens; a study at the Forest Products Laboratory has also shown that the fibres of most of the hybrids are rather longer than those of the latter.

2: 12.26-8: 33.8. KROTKEVICH, P. **Special management for the production of aircraft timber.** *Lesnoe Khozaystvo, Moscow* 1940 (8), (62-5). [R.] *Abstr. in Forstarchiv* 17, 1941 (317-8). [G.]

Investigations in the Ukraine have shown that the most suitable conditions for growing Oak and Ash for aircraft are to be found in the mixed Hornbeam/Maple/Lime woods. However, the number of good stems in these woods is only about 2.5 per ha, or 3.2 per cent. of the total number of stems. The chief requirement for growing high-grade Oak and Ash for aircraft is early and systematic care of the young stand, especially from 30 to 40 years of age, when the final stem form is developed; and the chief aim should be to secure constant and uniform crown development in the crop trees. Forks and epicormics can be kept down by cutting off the shoots. In establishing mixed stands, the Oak and Ash are best raised in strips, not mixed indiscriminately with Hornbeam, Maple, Lime, etc.

2: 12.26-8. LIMING, F. G. **Blackjack Oak in the Missouri Ozarks.** *J. For.* 40, 1942 (249-52). [Central States Forest Exp. Sta.]

Although the products of Blackjack Oak (*Quercus marilandica*) are of low merchantability, the tree has value as a ground cover, a nurse crop, a trainer, and a factor in natural thinning, and in the existing Blackjack Oak stands it is believed that the number of trees of the more valuable species has not been materially reduced by the presence of the Blackjack Oak trees. Most of the sites on which such stands are located will not support more than 90 mature trees per acre and natural improvement of stand composition is taking place rapidly through the high mortality of this species.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21.0. Adaptability to the General Environment. Acclimatization

21.0: 12.25 (41.1-4). ROGER, J. G. **The common Larch at high altitudes.** *Scot. For. J.* 55, 1941 (83-4).

In the highlands of Braemar the writer has observed vigorous dwarf shrubs of *L. decidua* growing spontaneously at altitudes of up to 2,950 ft.

21.0: 64: 12.19. AICHINGER, E. **Über die Ersetzbarkeit der Umweltfaktoren im Lebenshaushalt unserer Bäume, Sträucher und Kräuter. [On the replaceability of environmental factors in the life economy of our trees, shrubs and herbaceous species.]** *Mitt. H.-Göring-Akad. dtsh. Forstwiss.* 1, 1941 (67-86). [G.] *Abstr. in Forstarchiv* 18, 1942 (36). [G.]

The closer a plant grows to its limit of distribution, the lower is its ability to compete and the greater its dependence upon site factors that compensate for the unfavourable conditions. 'Soil indicators' have therefore only local significance; only in the same climatic region with the same vegetational history can the soil be determined by the presence of a particular plant, and only the total plant community can indicate the conditions of soil, climate and competition. Trees also occur on different soils in different climates and are particularly affected by competition. Efforts should be made to discover the distribution that tree species would assume without mutual competition and soil influences.

21.2. Moisture Requirements. Water Régime

21.2-3: 12.26-8. CENTRAL PROVINCES & BERAR. **Silviculturist's report for the year ending 31st March, 1941.** Govt. Printing, Nagpur. 1941. pp. vi + 71 + vi.

The Australian variety of *Prosopis juliflora* can successfully withstand drought and flourishes on the poorest soil in West Berar, trees reaching a height of 12-15 ft. and a diameter of 9 in. in 5 years (p. 54).

21.3. Soil Requirements

21.32: 12.26-8: 11.42.3: 11.47.13. McCOMB, A. L., and KAPEL, F. J. **Effect of subsoil acidity and fertility on the growth of seedling Black Locust and Green Ash.** *Plant Physiol.* 17, 1942 (7-15). [Iowa State College, Ames.] O.B.D.

One-year-old seedlings of Black Locust and Green Ash were grown in 4-gallon crocks on a yellowish-brown, infertile, sticky clay of pH 4.3, corresponding to the upper C horizon of the Lindley series. Four acidity levels were maintained—pH 4.3, 6.6, 6.9, and 7.7—with three fertility treatments at each level: (i) no fertilizer; (ii) N and K; (iii) N-P-K. Results at the end of 5 months' growth showed that regardless of soil pH the seedlings of both species grew very poorly, if at all, when no fertilizer was added. Both species showed a tremendous response to N-P-K at all pH levels, and no response to N and K, thus indicating that P was the element most limiting growth. Both species developed best at pH 4.3 when P was added, and growth decreased as pH values increased. When P was omitted, growth of both species increased up to pH 6.9 and decreased again at pH 7.7. Green Ash

developed almost as well at the alkaline pH as at the other levels, while Black Locust grew very poorly at pH 7.7. The results are interpreted largely in terms of phosphate availability. The fact that best growth occurred at pH 4.3 is attributed to the relatively high base saturation and the apparently adequate quantities of individually important bases. The results also suggest the desirability of fertilizing seedlings when reforesting badly eroded sites of this soil series. *From authors' summary.*

21.8. Phenology

21.8 (410) : 12.1 : 13.15 : 11.21. GUNTON, H. C. Report on the phenological observations in the British Isles from December, 1940, to November, 1941. No. 51. *Quart. J. R. met. Soc.* 68, 294, 1942 (89-119).

21.8 : 12.25 : 56.02 : 12.11.23. FIELDING, J. M., and MILLETT, M. R. O. Some studies of the growth of Monterey Pine (*Pinus radiata*). Part I.—Diameter growth. *Bull. For. Bur. Aust.* No. 27, 1941. pp. 3.

The paper deals with dendrometric studies of *Pinus radiata* in two Australian plantation areas of very different climates:—the dry table-land climate of Canberra in the region of irregular rains and the more favourable forest climate with seasonal rains at Mount Burr. The nature and course of diameter growth at each locality and the shrinkages associated with transpiration losses are discussed.

The trunks are constantly swelling and shrinking in response to atmospheric conditions and growth processes; they never remain the same size for more than a few hours. Thus the study of actual growth is complicated and it is difficult to determine by dendrometer measurements exactly when cambial activity begins or ends. During the daylight hours of practically every day the trunks shrink in response to transpiration losses. Vigorous and young trees shrink more than trees less vigorous and old, and shrinkages are greatest in summer. Swelling follows the release of sap tension in the tracheids. Thus daily shrinkages are usually made up at night, and immediate swellings follow showers that wet the needles and saturate the atmosphere. Vigorously growing trees swell more than those growing slowly or not at all, and put on increment at the same time. Rainfall appears to have an important influence on growth apart from its influence on soil moisture, and the increment of trees kept constantly watered is still considerably influenced by annual rainfall. The growth at higher levels on the trees appears to be maintained for a longer period during summer than growth at breast height. At Canberra, a region of non-seasonal rainfall, the only clearly defined period of diameter growth is spring. In summer and autumn, bursts of growth always follow soaking rains, but during the dry months which are frequent in Canberra summers, the trees shrink considerably. For about 3 months in winter there is practically no diameter growth. At Mount Burr there are two main periods of diameter growth—spring and autumn. The autumn growth comes almost to a standstill at the onset of winter for 3 months—June, July and August. The spring growth continues until the summer drought. It is then seriously retarded, particularly in the lower parts of the trunk where a complete cessation of diameter increment may occur. During the summer, important bursts of growth are associated with soaking rains. *From authors' summary.*

22. SILVICULTURAL SYSTEMS. FORMS OF STAND
22.14.2 : 22.82.1 : 57.4. KOCH, E. 'Selective cutting' in even-aged stands. *J. For.* 40, 1942 (56). [U.S. Forest Service.]

Further comment on an article by L. E. Chaiken [cf. *For. Abs.* 3 (41, 210-1)]. It is pointed out that selective or partial cutting that removes the best dominants in even-aged stands resulting in the sudden exposure of the overtopped residuals, is the wrong principle to apply in any forest type that occurs in even-aged stands. Such stands, at maturity, require a reproduction cutting either in the form of a clear cutting with selected seed trees or a lighter shelterwood cutting. In either case the residual trees should be among the best in the original stand.

22.89 (66.9) : 23.3. BETTS, T. F. The Tiv plantations—1939 to 1941. *Farm & Forest* 2, 1941 (110-3).

Cf. *For. Abs.* 3 (299). By 1939 it was observed that block plantations of *Cassia siamea*, planted at 6 ft. × 6 ft. espacement, after 3 years' vigorous growth, were showing a marked reduction in height growth and leaflet size and an increasing vulnerability to insect and fungus attack. Subsequent plantation work was confined to the establishment of *Gmelina arborea* and Teak on favourable sites and the protection and treatment of certain areas to improve conditions for the natural re-growth of woody vegetation. Also encouragement was given to the planting on household surrounds. Investigations into the cause of the stagnation of *Cassia siamea* are described.

23. FORMATION OF STANDS

23.1. Natural Regeneration

23.1 (71). ROBERTSON, W. M. Establishment of reproduction of usable species. *Pulp Paper Mag. Can.* 43, 1942 (267-9, 266). [Dominion Forest Service.]

Available information indicates that, in general, natural regeneration on cut-over lands in Eastern Canada is more than sufficient and that Balsam Fir tends to replace Spruce. Factors which influence regeneration in this region, and which can be affected by forest exploitation, include light and moisture, soil and seedbed conditions and seed supply. The author discusses certain characteristics of Black and White Spruce and Balsam Fir that are of importance in the regeneration of these species, and also certain treatments for improving conditions for regeneration in both softwood and mixedwood cover types.

23.11.4 : 12.26-8 : 22.2. CENTRAL PROVINCES & BERAR. Silviculturist's report for the year ending 31st March, 1941. Govt. Printing, Nagpur. 1941. pp. vi + 71 + vi.

An experiment has shown that well-grown Sal advance growth, retained after removal of the overwood, had much better basal-area increment over the first five-year period following operations than had the coppice that developed after comparable advance growth had been removed with the overwood (p. 20).

23.13 : 12.26-8. PATON, R. R. Effect of furrowing on natural reproduction of hardwoods. *Bi-m. Bull. Ohio agric. Exp. Sta.* 26, 1941 (161-8).

In a heavily grazed wood in Ohio bearing a few scattered seed trees and a heavy sod of grass and weeds, natural regeneration was attained by excluding livestock and by ploughing furrows spaced 6 ft. apart at right angles to the prevailing winds. A narrower spacing of the furrows (3-4 ft.) is recommended for optimum results.

23.2. Artificial Regeneration

23.2: 12.26-8. NELSON SMITH, J. H. The formation and management of Mahogany plantations at Silk Grass Forest Reserve [British Honduras]. *Carib. For.* 3, 1941-42 (75-8). [E.e.span.]

Introduction of *Swietenia macrophylla* by direct sowing preceded by felling and burning has proved satisfactory provided a good strain of fresh seed is used. Mahogany is best grown under light shade conditions, so that the surrounding vegetation is just sufficient to discourage *Hypsipyla grandella* attack. It is not sound practice, however, to rely on natural regeneration for the provision of suitable nurse species. Also, until there is a very thorough knowledge of the regenerative power, rate of growth, and habits of the nurse species, there is little chance of producing well-formed Mahogany trees from plantations. Research in this direction has only recently started and as yet there are insufficient data on which to base any definite policy.

23.22. Preparatory Work. Auxiliary Measures

23.22: 12.25: 22.89. WAGENKNECHT, E. Über den Einfluss verschiedener Bodenbearbeitungsverfahren auf das Wachstum von Kiefernulturen. [On the influence of various methods of soil cultivation on the growth of Pine plantations.] *Z. Forst- u. Jagdw.* 73, 1941 (297-342, 369-99). [G.] [Waldbau- (Möller-) Institut der Forstl. Hochschule Eberswalde.]

The influence of different methods of soil cultivation on height growth, stocking, and root development of young Scots Pine was studied in dry, poor diluvial sands and in fairly moist, moderately fertile diluvial sands. Complete ploughing was the only method that gave consistently better height growth and stocking than strip ploughing, the cheapest of the methods investigated. Methods involving strip treatment with different types of cultivators all resulted in much the same crop quality, and though expensive, were not significantly more effective than ordinary strip ploughing. Complete ploughing is recommended chiefly for soils with a strong tendency towards grass and heath growth, since only this method keeps down the weeds sufficiently. On poor soils, strip ploughing is usually the most advisable method. The root studies showed that the humus turned over in strip ploughing is penetrated by the bulk of the lateral roots of the young plants; this disproves the belief that humus turned over by the forest plough becomes practically useless for the nutrition of the plants.

23.22.1: 12.26-8. CENTRAL PROVINCES & BEAR. Silviculturist's report for the year ending 31st March, 1941. Govt. Printing, Nagpur. 1941. pp. vi + 71 + vi.

In a planting experiment with Teak the original high mixed forest was clear felled and the slash burnt preliminary to planting. In an area where the slash burn was intense the Teak plants showed greater vigour than in an area where the burn was very light (pp. 9-10).

23.22.1: 12.26-8: 11.47. NEW YORK. Cornell University Agricultural Experiment Station. Fifty-fourth annual report, 1941. Ithaca, N.Y. 1942. pp. 202.

Black Locust showed better growth on land that was ploughed before planting than where planting was done directly in the sod. Growth rate was not increased by the use of lime or superphosphate or by tree inoculation (p. 99).

23.23. Sowings

23.23.1. Seed Procurement, Treatment, and Testing

23.23.12: 12.25: 21.8: 12.11.21. RUDOLF, P. O. When are Pine cones ripe? *Repr. from Proc. Minn. Acad. Sci.* 8, 1940 (31-8). [Lake States Forest Exp. Sta.]

A close correlation has been found between specific gravity of cones and ripeness of seed. Five or six cones from an individual tree are placed in a test liquid (kerosene for Red Pine and linseed oil for White Pine) and if 50 per cent. or more of them float the seed will show a reasonably good germination. For experienced collectors cone colour has been found to be a fairly good index of seed ripeness for Red, White, and Jack Pine in Lower Michigan.

23.23.15: 12.11.21. NEW YORK. Cornell University Agricultural Experiment Station. Fifty-fourth annual report, 1941. Ithaca, N.Y. 1942. pp. 202.

Studies of seed dormancy indicate the presence of a substance in the endosperm tissue which inhibits germination. The effect of this substance is removed by stratification (p. 142).

23.23.15: 23.23.19. TAYLOR, C. A. Germination behavior of tree seeds as observed in the regular handling of seed at the seed extractory and nursery, Norfolk, Nebraska. U.S.D.A. Forest Service, Prairie States Forestry Project. 1941. pp. 8 + numerous gphs.

Results from germination tests to determine the effects of storage and seed treatments are presented graphically in order to show the rates of emergence as well as the percentage of viable seed for the various species used, which included *Caragana arborescens*, *Catalpa speciosa*, *Celtis occidentalis*, *Crataegus coccinea*, *Elaeagnus angustifolia*, *Fraxinus pennsylvanica* var. *lanceolata*, *Gleditsia triacanthos* var. *inermis*, *Juniperus scopulorum*, *J. virginiana*, *Morus alba* var. *tatarica*, *Pinus ponderosa*, *Prunus americana*, *P. virginiana* var. *melanocarpa*, *Rhus trilobata*, *Robinia pseudoacacia*, *Toxylon pomiferum*, *Ulmus americana*, and *U. pumila*. A summary of results and recommendations for each species is included.

23.23.15: 12.25. HEIT, C. E. Storage of conifer seed. *New York Nursery Notes* No. 10, 1941 (2-3).

Conifers vary widely in the sensitiveness of their seed to various types of storage. *Pinus resinosa* appears to be the most tolerant of poor storage conditions and the hard Pines to be generally more tolerant than the soft Pines or other conifers. Spruces, Firs, Larches, and Cedars are all less tolerant than Pines and their sensitiveness appears to increase in the order named. The best conditions are afforded by storage in a sealed container at 34-38° F. and an initial seed moisture content below 8 per cent.; with this type of storage both *Thuja occidentalis* and *Abies balsamea* have retained their original viability for 5 years.

23.23.15: 12.25. WEBSTER, C. B., and RATCLIFFE, G. T. A method of forcing quick germination of *Juniperus virginiana* L. seed. *J. For.* 40, 1942 (268). [Soil Conservation Service.]

Seeds collected in late November were depulped and placed in dry storage until early February when they were treated as follows:—Soaked 20 minutes in a lukewarm sodium [soda?] lye solution, 3 tablespoons to 1 gal. of water; washed in fresh running water for 1 hour; soaked in fresh water for 8 hours; stratified in sand from February 4 to March 29. Seedlings averaged over 2 in. high by June 11.

23.23.15 : 12.25. ROE, E. I. **Longevity of Red Pine seed.** *Repr. from Proc. Minn. Acad. Sci.* 8, 1940 (28-30). [Lake States Forest Exp. Sta.]

On the basis of experimental results it is concluded that if seed of *Pinus resinosa* is stored in tightly sealed containers at temperatures of 32-40° F. and with moisture contents of not more than 6.5 per cent., the original viability can be maintained for at least 10 years. Temperatures of 40-50° F. may safely be used provided that the initial moisture content of the seed is reduced to less than 5 per cent.

23.23.15 : 12.25 : 12.11.21. ELIASON, E. J., and HEIT, C. E. **The effect of light and temperature on the dormancy of Scotch Pine seed.** *Repr. from Proceedings of the Association of Official Seed Analysts of North America* 1940. pp. 11. [New York State Conservation Dept., Albany, N.Y.]

Precocious germination in autumn sowings of certain lots of Scots Pine seed was found to be related to differences in seed dormancy, the least dormant seed being the most liable to germinate precociously, whereas the most dormant seed failed to show this phenomenon and also produced more trees when sown in autumn. Dormancy varied widely in different seed lots. In general, seed received from Europe was less dormant than that collected in New York State. The later the seed was collected the less its dormancy, but dormancy was influenced by other conditions that may be related to seed origin. Variation in dormancy occurred in seed from trees growing side by side, and individual trees produced seed of a characteristic colour or shade. Low temperature delayed germination almost equally in all seed lots. There were indications that alternating temperatures may aid in breaking dormancy and that too high temperatures may induce the dormant state. It was found that either light or after-ripening by chilling was necessary to induce the germination of dormant seed. Nursery sowings should be preceded by germination tests made in light and in darkness to determine the viability of the seed and the best time for sowing. Optimum laboratory conditions for germination of the most dormant seed lots were continuous artificial light and a temperature of about 18° C.; under such conditions germination was complete after 10 days.

23.23.15 : 12.26-8. MADRAS. **Annual report on silvicultural research in the Madras Presidency for the year 1940-41.** Supt., Govt. Press, Madras. 1942. pp. 146.

Fermenting greatly improved the seed germination per cent. of *Terminalia chebula* and slightly that of *Acrocarpus fraxinifolius* while concentrated sulphuric acid treatment appears to have improved that of *Acacia arabica*, *Cassia auriculata*, *C. fistula*, and *C. marginata* (p. 14). Removal of the pulp improved the germination per cent. of *Aglaia roxburghiana* seed (p. 17).

23.23.15 : 12.26-8 : 21 : 57 : 34.2. PENEFF, N. Untersuchungen am Saatgut der Robinie. (*Robinia pseudo-acacia* L.), vor allem über die Überwindung der Hartschaligkeit. [Research on seed of Black Locust (*Robinia pseudoacacia* L.), especially on treatment to overcome 'hard-shelledness'.] Forschungs- und Prüfstelle für forstliches Saatgut, 52 Amalienstrasse, München. [1941?] pp. 84. *Abstr. in Allg. Forst- u. Jagdztg.* 118, 1942 (55). [G.]

An introductory review is made of the history of Black Locust as an introduced tree in Europe. As this species is a fast grower and not exacting, it is of importance for the afforestation of waste lands, the

fixation of shifting sand, and the formation of wind-breaks in poorly wooded regions. In coppice forests on first-quality sites in Bulgaria it yields a timber volume of 362 cu. m. per ha. in 25 years, whereas the yield of Oak under like conditions is only 154 cu. m. per ha. Black Locust is also useful for leaf fodder, as a bee tree, and as a source of ethereal oils, medicinal substances, and tannins. A description is given of the general characters and morphology of the seed and particular attention is given to the problem of improving its low viability, which is due to the hardness and impermeability of the seed coat. A detailed account is given of literature and of the author's own research on the treatment of seed by scarification, with sulphuric acid, hot water, etc. Seed scarified in a machine designed by the author showed almost 100 per cent. viability, as against only 38 per cent. in untreated controls. It is estimated that some 20,000 kg. of Black Locust seed could be saved annually in Bulgaria if proper methods of seed treatment were employed. The present quantity consumed in that country is 30,000 kg.

23.23.19 (67.6). **Seed germinations.** *Bull. For. Dep. Kenya*, No. 32, 1939. pp. 18.

A tabular statement of data on the germination of a large number of trees grown in Kenya. The data give an indication of average germination under varying nursery conditions, and other useful information.

23.23.3. *Methods of Sowing*

23.23.3 : 12.25 : 12.26-8. CANADA. **Silvicultural research operations 1940-41.** *Silvic. Res. Note Dom. For. Serv.* No. 69, 1941. pp. 29.

Experiments undertaken in Alberta show that spring sowing is preferable to fall sowing for White Spruce and Douglas Fir and that fall sowing gives better results for Birch. Ash sown in one spring germinates the following spring (p. 27).

23.23.3 : 12.25 : 23.23.15 : 12.26-8. CANADA. **Silvicultural research operations 1940-41.** *Silvic. Res. Note Dom. For. Serv.* No. 69, 1941. pp. 29.

Broadcast sowing of conifer seeds in seedbeds with a shallow covering of fine sand gives better results than sowing in drills, the former method affording more protection against damping-off and competing vegetation. It appears that Ash seeds of different species and strains require different periods of stratification (pp. 11-12).

23.23.3 : 12.25 : 23.22.1. PENNSYLVANIA. **Science for the farmer: 54th annual report of the Pennsylvania Agricultural Experiment Station for the fiscal year ended June 30, 1941.** *Bull. Pa. agric. Exp. Sta.* No. 414, 1941. pp. 63. A.P.B.

Virginia Pine (*Pinus virginiana*) has been successfully established on abandoned fields by direct sowing, subsequent seedling height being improved by loosening the soil at the time of sowing (p. 21).

23.24. Formation of Stands by Planting

23.24 : 07.1. DAVIS, J. E., and POND, J. D. **Hand-planting forests: Forestry for 4-H Club boys and girls, first year—tree planting.** *Jun. Ext. Bull. Cornell Univ.* No. 28, (revised ed.) 1940. pp. 20.

23.24 : 12.26-8. MADRAS. **Annual report on silvicultural research in the Madras Presidency for the year 1940-41.** Supt., Govt. Press, Madras. 1942. pp. 146.

Experiments in the stump planting of Teak show that early stump planting is advantageous and that planting the stumps with the top of the 1-in. shoot flush with the ground is beneficial both as regards survival and height growth (p. 38).

23.24.1. Planting Material

23.24.1 : 12.26-8 : 23.22. MARREROL, J. Study of grades of Broadleaved Mahogany planting stock. *Carib. For.* 3, 1941-42 (79-88). [E.e.s.p.a.n.] [Tropical Forest Exp. Sta., Rio Piedras, Puerto Rico.]

Marked differences were found in the one-year survival of seedlings of *Swietenia macrophylla* and *S. candollei* planted in different localities within the climatic range of these species in Puerto Rico. Clean cultivation was superior to corona (a system involving only partial weeding), particularly in very weedy places. The one-year survival of cull seedlings (less than 2 ft. high, spindly) was not inferior to that of normal stock (2-3 ft. high). Oversize stock (4-6 ft. high) was decidedly inferior to normal stock. Cutting back did not increase the survival of normal stock, but when oversize stock was cut back to 4 in., survival at the end of the first year was equal to that of normal stock.

23.24.2. Methods of Planting

23.24.2 : 07.7. U.S. Forest Service devises tree planting machine. *J. For.* 40, 1942 (60).

This machine, which is similar in some ways to a vegetable plant setter, is mounted on a unicarrier and its operation requires a two-man planting crew and a tractor driver. It is particularly suited to the relatively deep, level soils of the prairie-plains region. It is capable of planting 8,000 trees or shrubs a day, and the survival and growth of machine-planted trees equal those of hand-planted stock in the same vicinity.

23.24.3. Spacing

23.24.3 : 12.25. ALABAMA. Fiftieth annual report, January 1 to December 31, 1939, of the Agricultural Experiment Station of the Alabama Polytechnic Institute. Auburn, Ala. [1940?]. A.P.B.

Of a number of spacing distances tested in the planting of Slash and Loblolly Pine, including 4 ft. $\times$ 4 ft., 6 ft. $\times$ 6 ft., 8 ft. $\times$ 8 ft., 12 ft. $\times$ 12 ft., and 16 ft. $\times$ 16 ft., it was found that the 6 ft. $\times$ 6 ft. spacing best fulfilled the requirement for an adequate number of trees from which to select about 150 vigorous, well formed trees per acre, reasonably well spaced, as the final crop (pp. 30-2).

23.26. Plant Rearing. Nursery Practice

23.26 : 12.26-8. MADRAS. Annual report on silvicultural research in the Madras Presidency for the year 1940-41. Supt., Govt. Press, Madras. 1942. pp. 146.

Studies of the effect of shade on germination and on plant per cent. showed that the species *Feronia elephantum*, *Terminalia chebula*, *Zizyphus xylopyrus*, *Schleichera trijuga* preferred open beds, while *Adenanthura pavonina*, *Alangium lamarkii*, *Chloroxylon swietenia*, *Erythroxylon monogynum*, *Mangifera indica*, *Pterocarpus marsupium*, *Santalum album*, and *Strychnos nux-vomica* preferred shaded beds (pp. 19-20).

23.26 : 12.26-8. CENTRAL PROVINCES & BERAR. Silviculturist's report for the year ending 31st March, 1941. Govt. Printing, Nagpur. 1941. pp. vi + 71 + vi.

Investigations made in West Berar indicate that raised nursery beds and periodic watering are not

necessary for the successful growth of Teak seedlings and that satisfactory results can be obtained from temporary nurseries near the planting site (p. 47).

23.26 : 23.22.2 (66.9). WARDROP, T. N. Notes on bush nurseries in Benin Division. *Farm & Forest* 2, 1941 (130-3).

Cf. *For. Abs.* 2 (203). A brief account of some problems connected with the use of bush nurseries in conjunction with *taungya* farming in Southern Nigeria.

23.27. Arboriculture

23.27 : 42.22. PALADINO, F. J. A new anti-desiccant for tree preservation. *Trees, Santa Monica, Calif.* 5 (1), 1942 (9).

Note on 'Protex', an anti-desiccant prepared from the latex of *Hevea brasiliensis*, which, when applied to the foliage of trees and shrubs by spraying or dipping, is claimed to protect the plants from excessive loss of moisture.

23.3. Afforestation

23.3. COPIEN. Über die Nutzbarmachung der Abraumkippen auf Braunkohlenwerken und die dabei gewonnenen Erfahrungen insbesondere bei Forstkulturen in der Niederlausitz. [On the reclamation of waste tips in lignite workings and experience gained on this question, particularly in forest plantations in Niederlausitz.] *Z. Forst- u. Jagdw.* 74, 1942 (43-77, 81-126). [G.]

Chiefly an account of the writer's experience with forest plantations on waste tips in the Niederlausitz. Scotch Pine is the main species used in afforestation.

23.3 (81) : 12.26-8 : 21.0 : 23.24.3 : 12.11.3. NAVARRO DE ANDRADE, E. The *Eucalyptus* in Brazil. *J. Hered.* 32, 1941 (215-20, 240). C.G.B.

Substantially the same as another article by the same author [*For. Abs.* 3 (128)]. Spacing trials with *Eucalypts* planted at distances varying from 3 to 6 m. showed that 3-m. spacing resulted in yields nearly 6 times as great as those from 6-m. spacing, the figures for total yields being 120 and 22 cords per acre, respectively. Western Australian species of *Eucalyptus* are said to have been failures in Brazil, though they have succeeded in countries such as Chile, Mexico, California and Cape Colony—all of which are on the western sides of the continents. The author has raised a number of hybrids, the best of which is '*E. paulistana*' (*E. globulus* $\times$ *robusta*). The parent species are unsuitable for Brazil, but the hybrid, which has now been bred to the 5th generation and has shown no variation since the 3rd generation, appears to be very promising and to possess the virtues of the parent species without having their defects.

23.3 : 12.26-8 : 23.24 : 33.51 : 47 : 57 (59.6-9). LATASTE, A. Note sur l'approvisionnement des mines en bois de soutènement en Indochine. [Note on the supply of supporting timbers for mines in Indo-China.] *Proc. 6th Pacif. Sci. Congr., Pacif. Sci. Ass., 1939*, 4, 1940 (547-53). [F.] C.G.B.

Reference is made to the difficulty of obtaining sufficient locally grown mining timber in Tonkin, due to the slow growth of suitable native tree species and the inaccessibility of the old-growth forests. As trials by the Forest Service had shown that *Casuarina equisetifolia* could be successfully grown on the sandy coastal tracts, the Société Indochinoise des Bois de Mine acquired two large strips of coast and began planting this species in 1929. The two areas are now carrying

more than 2,000,000 trees of 1-10 years of age. Owing to the extreme monsoon climate of the region the establishment of the plantations proper has to be preceded by that of shelterbelts on the shore side. The stock used for such belts is given a modicum of protection by staking sea-borne branches around each plant. At 3 years of age the belts give sufficient shelter for further planting. In cases where the roots of the young shelterbelt trees are exposed by wind a new hole, deeper than the tap root, is dug as close as possible to the plant without cutting the roots; slight pressure with the foot against the opposite side is then sufficient to shift the plant with root system intact to its new quarters. Spacing trials have shown the minimum planting distance to be 3×3 m. Topping has been found ineffective to reduce taper, but cutting back to ground level is a good means of provoking fresh sprouts in weakly trees that have been damaged in the collar region through wind shaking, though this measure is of no use if the poor growth is due to a defective root system. Beetles are a serious pest up to 2-3 years of age; the only control measures practised are hand-picking by teams of collectors for the youngest trees, and the digging of shallow ditches between old and new plantations, the ditches appearing to constitute an impassable barrier to the beetles. Trees are also attacked by a bark fungus, but this is at present far less of a menace than beetle attack. Poor growth in water-logged depressions is now largely avoided by planting out at the end of the rains. Other cases of poor growth have proved to be due to careless handling of the root system during planting. Animal manure has been valuable in the nurseries and at planting-out time, but after 1 year of age both this and phosphate seem to have no effect on growth. The first cuttings began in 1936, at 8 years from planting. So far, it appears that 70 per cent. of the trees will furnish at least 1 log 4.5 m. long $\times$ 10 cm. top diameter, 1 log 2-2.5 m. long $\times$ 7-8 cm. top diameter, and 6-10 m. of branches of 1.3 m. length and 4-6 cm. top diameter, these being the utilizable dimensions for pitwood. The new plantations on the cutting areas are showing faster and more regular growth than the first crop.

23.5. Underplanting. Shelterwoods. Nurses

23.51 : 12.26-8 : 23.2. MADRAS. Annual report on silvicultural research in the Madras Presidency for the year 1940-41. Supt., Govt. Press, Madras. 1942. pp. 146.

It has been shown that *Swietenia macrophylla* and *Cedrela toona* can be successfully underplanted under II and III quality Teak of about 37 years of age if plants are introduced in dense lines in order to reduce browsing damage. Transplanting of Mahogany and stump planting of *Cedrela* are more reliable than direct sowing (p. 85).

23.51-2 : 12.26-8. MADRAS. Annual report on silvicultural research in the Madras Presidency for the year 1940-41. Supt., Govt. Press, Madras. 1942. pp. 146.

Mahogany (*Swietenia macrophylla*) appears to require a shade crop in the early stages of development both to reduce attack by the shoot borer and as protection against over-exposure to the sun (p. 45).

24. TENDING OF STANDS AND TREES

24 : 12.25 : 57.0. RECKNAGEL, A. B. Ten year remeasurement of sample plots. *J. For.* 40, 1942 (265). [Cornell University.]

Remeasurement figures for Spruce and Balsam Fir in the softwood flat type show a reduction in volume per acre compared with measurements five years previously. A marked reduction is shown also for Spruce in the hardwood type. This is due largely to the moribund condition of the larger trees and indicates that a relatively short cutting cycle is necessary in order to have a sustained increment for these species.

24.1. Cleanings

24.1 : 12.25 : 56. Cleaning young Spruce and Balsam Fir. Project L.E. No. 7. *Silvic. Leaflet. Dom. For. Serv.* 7, 1941. p. 1.

Data from three permanent sample plots in Quebec indicate that the cleaning of 15- to 20-year-old Spruce and Balsam Fir stands results in an increased growth rate and is justified silviculturally.

24.2. Thinnings

24.2 : 12.25 : 21.6. UNION OF SOUTH AFRICA. Department of Agriculture and Forestry, Division of Forestry. Annual report for the year ended 31st March, 1941. Govt. Printer, Pretoria. 1941. pp. 18.

In a plantation of *Pinus patula* which was thinned from a density of 1,200 trees to 600 trees per acre in the second year and where the mean heights and diameters of the dominants were 24.5 ft. and 4.7 in. respectively at 4 years of age, it was found that the dominants in a stand of 1,200 trees per acre are significantly suppressed after the second year, and the dominants in a stand of 600 trees per acre after the third year (p. 13).

24.2 : 12.26-8 : 34.24. UNION OF SOUTH AFRICA. Department of Agriculture and Forestry, Division of Forestry. Annual report for the year ended 31st March, 1941. Govt. Printer, Pretoria. 1941. pp. 18.

Results from experimental plots in tan-bark Wattles (*Acacia* spp.) indicate that fairly heavy thinnings down to approximately 400 trees per acre should be completed before the end of the second year and that further thinning should continue in the third and fourth year (p. 14).

24.22 : 24.25 : 12.25. KRENN, K. Die Vorteile des frühen Eingriffs in Fichtenbestände. [The advantages of early thinnings in Spruce stands.] *Allg. Forst- u. Jagdztg.* 118, 1942 (41-7). [G.] [Badische Forstliche Versuchsanstalt, Universität Freiburg i. Br.]

A 32-year-old stand that had been heavily thinned for the last 9 years, by the removal of half the total stems at 23 years and subsequent lighter thinnings, produced 20 per cent. more timber, including past thinnings and residual stand, than the practically unthinned control.

24.3. Opening of the Canopy. Release and Improvement Fellings

24.31. MEADLEY, G. R. W. The use of arsenic compounds for killing green timber. *J. Dep. Agric. W. Aust.*, Ser. 2, 18, 1941 (68-70). A.P.B.

A practical note on the use of arsenicals for poisoning. In New South Wales sodium arsenite has been largely superseded for this purpose by arsenic pentoxide, which appears to have greater penetrating power and has been shown to be more effective than the former compound against trees that are liable to sucker. Arsenic pentoxide is used at the strength of 3 lb. per 5 gal. of water.

24.31 : 12.26-8. WESTVELD, M. Some effects of incomplete girdling of northern hardwoods. *J. For.* 40, 1942 (42-4). [Northeastern Forest Exp. Sta.]

A high proportion of trees survive incomplete girdling and the value of this measure for improving the quality and growth of forest stands is reduced accordingly. In brief, suggestions made for improving girdling success are:—(1) Development of efficient girdling crews. (2) Selection of suitable girdling methods for particular conditions—(a) notching should be used only on trees with infolding bark seams or other irregularities; (b) the peeling method should be used during the bark-slipping period; (c) double hacking (frilling) is recommended where inefficient labour is employed, though where competent axemen are available single hacking should suffice.

24.36 : 23.1 : 12.26-8. KUENZEL, J. G., and MCGUIRE, J. R. Response of Chestnut Oak reproduction to clear and partial cutting of overstory. *J. For.* 40, 1942 (238-43). [Central States Forest Exp. Sta.]

Average total height growth of Chestnut Oak reproduction at the end of a 10-year period under conditions of clear-cut, partial-cut, and uncut second-growth stands of this species in southern Indiana was 4.8, 0.82, and 0.48 ft. respectively. Most of the Chestnut Oak reproduction on the clear-cut area 10 years after cutting was of seedling origin, but 97 per cent. of all the Chestnut Oak trees more than 1.0 in. d.b.h. were sprouts. These sprouts had attained an average height of 21.1 ft. while only a small number of seedlings had successfully established themselves in the overstory.

24.4. Shelterbelts. Windbreaks

24.4. KARUZIN, B. V. The planning of shelterbelt location. *Sovetsk. Agron.* 1940 (10), (7-10). [R.] H.S.B.

24.4 : 11.12. PANFILOV, Y. A contribution to the problem of the effect of shelterbelts on wind velocity on steep slopes. *Sovetsk. Agron.* 1940 (10), (11-17). [R.] H.S.B.

From studies in the Saratov and Kuibyshev regions on the location of windbreaks for crop protection and the control of wind erosion on steep slopes, it is tentatively suggested that shelterbelts should be placed so that a windbreak runs along every line marking a major change in gradient.

24.4 : 11.12 : 11.41.3. BANASEVICH, N. N., and ZAKHAROV, N. G. The effect on soil moisture of shelterbelts of different wind permeability. *Sovetsk. Agron.* 1940 (10), (63-5). [R.] H.S.B.

Measurements in the Vladimir (southern chernozem) region showed that, as compared with unprotected fields, the top 100 cm. of the soil in fields protected by 5-row windbreaks 10 m. high had a considerably higher moisture content in early summer on both the lee side (up to a distance of about 250 m.) and the windward side (up to 100 m. distance).

24.4 : 60.1. KUCHERYAVYKH, E. G. The effect of

shelterbelts of different structure on crop yields. *Sovetsk. Agron.* 1940 (10), (18-22). [R.] H.S.B.

Five-row windbreaks in the Vladimir (southern chernozem) region were as effective in increasing crop yields as those of 20 rows or more. Oat yields were increased by 25-28 per cent. The 5-row belts should have a minimum permeability to wind except in the lowest 20-25 per cent. of the stand, which should be as permeable as possible to ensure maximum decrease in wind velocity and an even distribution of the snow on the fields.

24.4 : 60.1 : 11.22 : 91.3. NÄGELI, W. Importance des rideaux-abris contre le vent pour la protection des cultures agricoles. [Importance of shelterbelts for the protection of agricultural crops.] *J. for. suisse* 93, 1942 (1-20). [F.]

A summary of recent Russian, American, and other literature on the subject.

24.4 (79.4) : 11.47 : 24.51 : 96.4. Windbreaks require care: proper management is essential in maintaining an efficient windbreak. *Calif. Citrogr.* 27, 1941-42 (67). L.S.

A report of addresses at a windbreak demonstration meeting, with particular reference to the need for supplying Eucalypt windbreaks with adequate water and fertilizers, and of periodical branch and root pruning. Machines available for both of the latter purposes were demonstrated. The Soil Conservation Service grants subsidies towards the planting and maintenance of windbreaks, subject to certain safeguarding conditions.

24.5. Pruning

24.51 : 07.7. Relative efficiency of various types of pruning saws. Project 39. *Silvic. Leaflet. Dom. For. Serv.* No. 5, 1941. p. 1.

Of the saws tested, the 14-in., 8-point curved California type was most efficient. A saw with 2 teeth and raker per inch was found to be more satisfactory than fine-toothed saws for branches over 1 in. in diameter.

24.51 : 12.25. CUMMINGS, W. H. Early effects of pruning in a young Shortleaf Pine planting. *J. For.* 40, 1942 (60-2). [Central States Forest Exp. Sta.]

Pruning of 4-year-old Shortleaf Pines (*Pinus echinata*) up to half the total tree height caused a marked decrease during the next two growing seasons in diameter increment at 1.5 and 4.5 ft. above ground but did not significantly affect height growth or diameter growth at 7.5 ft. Thus pruning resulted in a marked decrease in stem taper.

24.51 : 12.26-8. MADRAS. Annual report on silvicultural research in the Madras Presidency for the year 1940-41. Supt., Govt. Press, Madras. 1942. pp. 146.

Pruning of young Teak plantations up to the height that could be reached from the ground did not affect survival percentage but retarded height growth to a significant extent (p. 84).

3. FOREST UTILIZATION. FOREST TECHNOLOGY

3 : 02.1 (54). TROTTER, H. *Manual of Indian forest utilization.* Oxford University Press. 1940. pp. 419. [Forest Research Institute, Dehra Dun.]

The publication of this book appears to have been dogged by a series of unfortunate delays. The author

explains that nearly eight years have elapsed since it was first written and, though the volume bears the date 1940, it does not appear to have reached this country till 1942. As a result it is not quite up to date, though it is not always easy to discover whether certain aspects

have been omitted on this account or by design, as the book is not intended as a comprehensive work on utilization in all its aspects. It has been written to serve primarily as a text-book for Forest Ranger students, while at the same time including enough factual information to be of interest to other Forest Officers in India. It replaces Troup's 'Indian Forest Utilization', which was last issued in 1912.

With such objectives in view it is rather a difficult book to review from an outside point of view. It shows some internal evidence of being written for a particular course at Dehra Dun and of assuming practical demonstration of many of the points described. Without such demonstrations some of the descriptions are not very satisfactory. For example, 'The log frame sawing machine consists of a saw frame in which a number of straight frame saws are fastened vertically', is not very explanatory. While the object of the book demands an elementary treatment, the subject itself covers a surprisingly wide field, and it is evident that the Indian Forest Ranger is expected to have a very wide knowledge of forest utilization. The account of plywood is very meagre for such an important subject, being limited to two pages, most of which is concerned with ornamental veneers.

The work is divided into four parts. The first covers the usual operations intervening between the mature tree in the forest and the actual use of the wood as timber, and includes an introductory account of the anatomical structure and properties of wood. It is somewhat surprising to read that 'Motor transport . . . is not a means of extraction employed much in India' and to find the whole subject dismissed in a short paragraph, which includes no mention at all of caterpillar tractors, though a few pages later American power skidding methods are considered worth a brief description. This part concludes with a long section on the uses of Indian woods for particular purposes, containing much valuable information.

Part II is concerned with seasoning, preservation, sawmills and wood workshops. The section on seasoning is devoted almost entirely to the principles and practice of air drying, and kiln drying is only very briefly and generally touched on, readers being referred for more detailed information to the special literature on the subject issued by the F.R.I. The third part, on the utilization of minor forest products, follows closely the corresponding section of Troup's book and relatively few changes have been necessary to bring this part up to date. The fourth part is headed 'Important Forest Products Industries' and includes accounts of the lac and resin industries, charcoal burning, paper and pulp, and grazing and grass cutting. Except in the case of grass, these sections have been much expanded, compared with the corresponding sections of Troup's book, yet it is here that one is perhaps most conscious that the book fails to cover the ground up to the present time; perhaps some of the more recent research, such as that on the properties of shellac, which one expects to find mentioned, has been purposely omitted as outside the scope of the book. Finally there is a macroscopic key for the identification of about thirty of the most important timbers and a useful series of appendices, which provide samples of actual marking rules, sales notices and forms of contract, and sleeper specifications.

Though admirable for its expressed purpose, and it is perhaps impertinent to ask more, for persons outside

India the book tends to fall between two stools, being too local in outlook to serve as a textbook in forest utilization, and not sufficiently advanced in treatment to serve as a book of reference. Nevertheless there is much in it that will serve the latter purpose, particularly the details of the uses and properties of the individual species; and the general picture that can be drawn of forest utilization in India may prove instructive to foresters in many other parts of the world. The book is very competently, but not lavishly, illustrated and the price of thirty shillings seems rather high for the size of the book and is in any case a large sum to ask of Ranger students.

L. CHALK.

31. PROPERTIES AND ANATOMY OF WOOD

31.0. *General Information on Woods*

31.0. *Timber Leaflets* Nos. 1-63 (Nos. 22, 30, 36, 42, 47 missing). Timber Development Association, Ltd., 75, Cannon Street, London, E.C.4. [?] -1942.

Each leaflet gives briefly the name, distribution, tree characteristics, wood characteristics and qualities, uses and supplies of a commercial timber species.

31.0 : 12.26-8 : 32 : 33. Eignung, Einschnitt und Pflege des Ahornholzes. [Uses, conversion and treatment of *Maple wood*.] *Holz-Zbl.* 66 (105), 1940 (691-2). [G.] *Abstr. in Holz* 4, 1941 (113). [G.] P.R.

The conversion of Maple wood needs special care. To preserve the white colour, cross-cutting must be done in March-April at the latest, the bark being left on to prevent checking. Freshly sawn boards must be immediately brushed free of sawdust, stored upright in racks for 2-4 weeks with free ventilation, and then seasoned in horizontal stacks under cover. Seasoning is completed in a year. The wood is used for table tops, washboards, turned goods, etc. Wood of *Acer pseudoplatanus* weighs 590 kg./cu. m. air-dry and is the lightest in colour; those of *A. platanoides* and *A. campestre* are yellower and weigh 620 and 680 kg./cu. m. respectively.

31.0 : 12.26-8. Ist Spitzahornholz minderwertig? [Is Norway Maple wood of little value?] *Dtsch. Holz-wirtsch.* 57 (228), 1940. [G.] *Abstr. in Holz* 4, 1941 (113-4). [G.] P.R.

Wood of *Acer platanoides* is inferior to that of *A. pseudoplatanus* for certain purposes, owing to its yellowish colour, coarser texture and greater hardness. It is, however, a favourite wood for wheelwrighting, tool handles, saw frames, carving, etc. *Acer pseudoplatanus* has a fine-textured wood of a white colour that is unaffected by washing and is therefore much sought after for making articles such as table tops and kitchen utensils.

31.0 : 12.26-8. The properties of Australian timbers: Brown Alder and Rose Alder (*Ackama muelleri* and *A. quadrivalvis*). *Mon. News Lett. Div. For. Prod. Aust.* No. 120, 1942 (3).

31.0 : 12.26-8 : 98.1 : 34.24 (75.6). CRUIKSHANK, J. W., and ROBERTS, E. V. The supply and industrial use of Chestnut in North Carolina. *Sth. Lumberm.* 164 (2062), 1942 (37-40). [Appalachian Forest Exp. Sta.]

Although practically all American Chestnut (*Castanea dentata*) has been killed by the blight *Endothia parasitica*, and most of it has been dead for 10 years, a large amount still remains standing and the durable

heartwood is used for lumber, extract wood, pulpwood, etc. It is estimated that about 300 million bd. ft. of the material suitable for sawlogs will be salvaged and that cutting will continue for 5–10 years. Of the 5 million cords of Chestnut now available for extract wood, 50 per cent. will be lost through deterioration at the present rate of operation.

31.0 : 12.26–8. The properties of Australian timbers: Silver Quandong (*Elaeocarpus grandis* F. v. M. and E. hirtonii F. v. M.). *Mon. News Lett. Div. For. Prod. Aust.* No. 119, 1941 (5).

31.0 : 12.26–8. The properties of Australian timbers: Yellow Box (*Eucalyptus melliodora* A. Cunn.). *Mon. News Lett. Div. For. Prod. Aust.* No. 122, 1942 (4).

31.0 : 12.26–8. The properties of Australian timbers: Leatherwood (*Eucriphia lucida* (Labill.) Baill.). *Mon. News Lett. Div. For. Prod. Aust.* No. 121, 1942 (3).

31.0 : 12.26–8. Teak (*Tectona grandis*). Timber Development Association, London. pp. 9.

This mimeographed pamphlet gives the names of Teak (*Tectona grandis*) and of Teak substitutes, the distribution of Teak, tree characteristics, wood characteristics and qualities, principal uses, and sizes of Teak lumber ordinarily available.

31.0 : 12.26–8. BRUSH, W. D. Foreign woods: Teak (*Tectona grandis*). U.S.D.A. Forest Service, Washington, D.C. 1941. pp. 11 + map. P.R.

A revision of the pamphlet noted in *For. Abs.* 1 (172).

31.0 : 12.26–8 : 2 : 32 : 33. Der Anbau, die Eignung und der Einschnitt der Linde. [The cultivation, uses and conversion of Lime.] *Dtsch. Holzwirtschaft.* 57 (242), 1940. [G.] *Abstr. in Holz* 4, 1941 (113). [G.] P.R.

The Lime remains sound up to an advanced age and usually furnishes clear, cylindrical butt logs. Its wood is white to brownish, fine-textured, easy to work, and is one of the lightest and softest of German hardwoods, weighing 650 kg./cu. m. when green and 530 kg./cu. m. at 15 per cent. moisture. The wood is used as a substitute for Okoumé and Abachi in the veneer industry, for imitation Ebony (as it dyes readily), woodcuts and carving, signboards, panels, table tops, kitchen tools. It is more durable than Beech, Hornbeam or Maple. When rapid conversion is impossible, logs should be end-coated. Rapid drying will cause checking and should be avoided; bark should remain on the log until final conversion.

31.1. Structure. Anatomy. Identification

31.1 : 12.14.1. FREY-WYSSLING, A. Dispersion of cellulose strands in cell walls. *Nature, Lond.* 149, 1942 (384). [Laboratory of Plant Physiology, Swiss Federal Institute of Technology, Zurich.]

R. D. Preston's research on conifer tracheids, the *Valonia* cell wall and the parenchyma of the *Avena* coleoptile is discussed and doubts expressed as to the validity of his conclusion that there exists only one type of cell wall texture, the parallel, and that 'a change in the dispersion of a single direction . . . may only be accepted when other possible causes have been ruled out'. The author maintains that the existence of dispersed and ramified cell walls is not disproved by Preston's observations on extinction angles under the polarizing microscope and provides positive evidence of dispersion in the walls of latex vessels of *Euphorbia splendens* and calculates the angle of dispersion by a study of the dichroism observed under the polarizing microscope after staining with chlorozinc-iodine.

31.1 : 12.25. BANNAN, M. W. Wood structure of *Thuja occidentalis*. *Bot. Gaz.* 103, 1941 (295–309). [University of Toronto.] O.B.D.

(i) Studies of samples from different parts of the tree, from trees of different sizes, and—in the case of roots—from roots growing under different environmental conditions, revealed much variation in the structure of the secondary xylem. (ii) Some features usually recognized as variable, namely size of tracheids, number and size of crossing-field pits, height and distribution of rays, and height and width of ray cells, were found to vary widely; in some cases definite trends were recognizable in different parts of the tree. (iii) Other characters more generally regarded as diagnostic, such as the arrangement of the intertracheary pits on the radial walls of tracheids, the degree of development of the torus, the presence or absence of crassulæ, the size and shape of the apertures in the crossing-field pits, and the thickness of the walls of ray and wood parenchyma cells, also varied greatly, often within the same piece of wood. (iv) In view of such variability it is obvious that caution must be exercised in the selection of diagnostic characters for the identification of woods. *Author's summary.*

31.1 : 12.26–8. HEIMSCH, C. Wood anatomy in the Gruinales and Terebinthales of Wettstein with reference to taxonomic grouping. *Abstr. in Amer. J. Bot.* 28 (10), 1941 (18s). [University of California, Berkeley.] O.B.D.

Conclusions from an examination of the secondary xylem of over 1,000 species of 440 genera in 37 families are that the Burseraceae, Meliaceae, Sapindaceae, Rutaceae, Simarubaceae and Anacardiaceae seem to constitute one phyletic complex, and the Linaceae, Humiriaceae, Erythroxylaceae, Polygalaceae, Tremandraceae, Trigoniaceae, Zygophyllaceae, Malpighiaceae and Vochysiaceae appear to constitute another.

31.1 : 12.26–8. WEBBER, I. E. Systematic anatomy of the woods of the Burseraceae. *Lilloa* (Tucumán) 6 (2), (441–65). *Trop. Woods*, No. 69, 1942 (47–8).

The wood anatomy of the Burseraceae is described and compared with that of the Anacardiaceae, Rutaceae, Simarubaceae, and Meliaceae. Similarities in wood structure suggest the probability of a common origin for these families. The woods of the Meliaceae are the most specialized, and those of the Simarubaceae and Rutaceae are somewhat more specialized than those of the Burseraceae and Anacardiaceae. Traumatic intercellular cavities in the rays of the Simarubaceae and Rutaceae suggest the origin of these families from plants such as the Burseraceae and Anacardiaceae that have normal intercellular canals in their rays.

31.1 : 12.26–8. BAILEY, I. W., and HOWARD, R. A. The comparative morphology of the Icacinaceae. III. Imperforate tracheary elements and xylem parenchyma. *J. Arnold Arb.* 22, 1941 (432–42). [Biological Laboratories, Harvard University.]

The data presented indicate that there are major trends of specialization in the imperforate tracheary elements and the wood parenchyma that are generally parallel to those occurring in the vessels. Though the modifications of the three categories of elements are not perfectly synchronized in all cases, the differentiation of the Icacinaceae into 3 groups, on the basis of differences in vessel structure, serves also to segregate

the imperforate tracheary elements and wood parenchyma into 3 general levels of increasing specialization. [Cf. *For. Abs.* 3 (30, 134).]

31.1 : 12.26-8. BAILEY, I. W., and HOWARD, R. A. The comparative morphology of the Icacinaceae. IV. Rays of the secondary xylem. *J. Arnold Arbor.* 22, 1941 (556-68). [Harvard University.]

The Group I Icacinoidae have a high ratio of primitive heterogeneous rays, the Group III Icacinoidae a high ratio of more or less specialized ray types, while the Group II Icacinoidae are transitional and show various trends of deviation from the primitive type. Interrelations between the major trends of specialization in the wood elements are discussed.

31.1 : 12.26-8 (7 : 8). RECORD, S. J., and HESS, R. W. American timbers of the family Lauraceae. *Trop. Woods No.* 69, 1942 (7-33).

Descriptions of the woods of the various genera, with notes on uses, common names, and distribution.

31.1 : 12.26-8 : 12.14. WITHNER, C. L. Stem anatomy and phylogeny of the Rhoipteleaceae. *Amer. J. Bot.* 28, 1941 (872-8). [University of Illinois, Urbana.] O.B.D.

The stem anatomy and external morphology of the Rhoipteleaceae are considered to place the family among primitive members of the Juglandales. No close relationship is indicated with the Julianaceae, Anacardiaceae, or other families with compound leaves and resin.

31.1 : 12.26-8. COX, M. J. The comparative anatomy of the secondary xylem of five American species of *Celtis*. *Amer. Midl. Nat.* 25, 1941 (348-57). [University of Illinois, Urbana.] L.S.

(i) Woods of *C. mississippiensis* Bosc., *C. selloviana* Mig., *C. swartzii* Planch., *C. triflora* Ruiz. ex Mig., and *C. occidentalis* L. are described. (ii) *C. occidentalis* and *C. mississippiensis* can be distinguished from *C. selloviana*, *C. swartzii* and *C. triflora*. *C. triflora* can be distinguished from *C. selloviana* and *C. swartzii*. (iii) *C. occidentalis* and *C. mississippiensis* are ring-porous and have spiral thickenings. The other three species are diffuse-porous and lack spiral thickenings. *C. triflora* can be recognized by the presence of septate wood fibers. (iv) *C. occidentalis* is indistinguishable from *C. mississippiensis* and only slight differences are found between *C. selloviana* and *C. swartzii*. (v) Variation is negligible in the wood of *C. occidentalis*. *Author's summary.*

31.1 : 12.26-8 : 01.4. DADSWELL, H. E., and ECKERSLEY, A. M. The card sorting method applied to the identification of the commercial timbers of the genus *Eucalyptus*. *J. Coun. sci. industr. Res. Aust.* 14, 1941 (266-80). [Division of Forest Products, C.S.I.R.]

Description of the multiple-entry perforated-card key developed by the Division of Forest Products, C.S.I.R., covering 76 commercial Eucalypts.

31.1 : 12.26-8. WILLIAMS, S. Secondary vascular tissues of the Oaks indigenous to the United States. II. Types of tyloses and their distribution in *Erythrobalanus* and *Leucobalanus*. *Bull. Torrey bot. Cl.* 69, 1942 (1-10). [University of Texas, Austin.] O.B.D.

(i) Tyloses are more abundant and a more constant feature in White than in Red Oaks, but the two subgenera cannot be distinguished with certainty by the presence or absence of these structures. (ii) In general, tyloses in *Leucobalanus* differ structurally from those in

Erythrobalanus. In the former they possess walls averaging 3-5 μ in thickness; in the latter two major morphological types can be recognized—(a) those with walls under 2 μ in thickness, which are abundant or even crowded, and (b) sclerosed tyloses with walls averaging 5-50 μ in thickness, which are often stratified and pitted and range from sparse to abundant. (iii) An intermediate type of tylosis occurs in two species of each subgenus (*Q. montana* Willd. and *Q. bicolor* Willd. in *Leucobalanus*; *Q. ellipsoidal* Hill and *Q. kelloggii* Newb. in *Erythrobalanus*) in which the wall is under 2 μ and the tylosic number is low. Further, two Red Oaks (*Q. marilandica* Muench. and *Q. cinerea* Michx.) have tyloses of the White Oak type throughout the heartwood. (iv) Structural variation of tyloses reaches a peak in *Erythrobalanus*, and several subdivisions, each embracing a number of species, can be recognized. (v) The White Oaks, in contrast, do not lend themselves to ready subdivision on this basis. (vi) In respect of chemical composition of tylosic walls two distinct types can be recognized—(a) tyloses with thin to moderately thick walls (under 5 μ), the latter composed of a central cellulosic layer with thin layers of lignin on its flanks, and (b) tyloses with thick (over 5 μ) and stratified walls that frequently possess pits, the wall composed of a lignified inner layer (middle lamella) followed centripetally by a cellulosic layer, with no layer of lignin to the inside. (vii) The physical nature of the tylosic content of *Quercus* woods can be used with much greater ease than the chemical distinctions specified in this paper. *From author's summary.* [Cf. *For. Abs.* 1 (170).]

31.1 : 12.26-8. WILLIAMS, S. Secondary vascular tissues of the Oaks indigenous to the United States. III. A comparative anatomical study of the wood of *Leucobalanus* and *Erythrobalanus*. *Bull. Torrey bot. Cl.* 69, 1942 (115-29). [University of Texas, Austin.] O.B.D.

In addition to the indications of subgeneric limits presented by the correlation between leaf form and late-wood pores and the type and distribution of tyloses, several further indications of the validity of these limits are noted. While none of these permits of an absolute segregation of species comparable to that described on the basis of leaf form and late-wood pore anatomy, they are of value and may be enumerated as follows:—(i) The frequency of longitudinal parenchyma is noticeably higher in *Erythrobalanus* than in *Leucobalanus*. In the Live Oak group of *Erythrobalanus* parenchyma is often so abundant that the zonate arrangement typical of *Quercus* is obscured. The shrubby species tend toward a high parenchyma volume, irrespective of the subgenus. (ii) The broad rays of *Erythrobalanus* are generally shorter and more abundant than those of *Leucobalanus*. The Live Oaks are distinct from the deciduous Red Oaks by the very short, stubby, extremely broad, excessively abundant rays, many of which are typically aggregate. Among the deciduous Red and White Oaks there is considerable overlapping in ray dimensions, but whereas the average ray height in the Red Oaks rarely exceeds $\frac{1}{2}$ in., average ray heights of $\frac{3}{4}$ -1 $\frac{1}{2}$ in. are common among the White Oaks. In general, dry site stimulates broader rays; dry site plus evergreen habit very broad, but shorter rays with a distinct tendency toward aggregation; wet site appears to exert no constant influence on width or height. (iii) Certain physical distinctions hold between the woods of the two subgenera. For example, colour of

heartwood may be used with reservation; the White Oaks have tan to dark-brown heartwood, devoid of reddish tinge, while the Red Oaks have heartwood with roseate cast, though there is considerable overlapping in this respect. The Live Oaks have the heaviest and the deciduous Red Oaks the lightest woods. *From author's summary.* [Cf. preceding abstract.]

31.2. Physical Properties

1.2 : 12.25. MIEDLER, K. A., and PRÜTZ, G. Die physikalischen und mechanischen Eigenschaften des Holzes der brasilianischen Araukarie. [Physical and mechanical properties of the wood of Brazilian Araukaria.] *Kolonialforstl. Mitt.* 3, 1940 (58-71). [G.] *Abstr. n Holz* 4, 1941 (38). [G.] P.R.

The following data are based on an investigation of 5 stems of *Araucaria angustifolia* O. Ktze. from southern Brazil:—Heartwood light yellowish-brown. Latewood percentage low (to 22 per cent., average 8 per cent.; only 2-6 cell rows wide); transition from early to late wood gradual; early wood thicker-walled than in *Pinus sylvestris*. Fibre length (1.5-)(5-)(7.5) mm.; fibres 25 per cent., medullary rays 5 per cent. Pits 2- to 5-ranked in the fibres; pit opening hexagonal. Rays averaging 7 cells high. Resin ducts and parenchyma absent. Specific gravity oven-dry (0.37-)(0.51-)(0.62). Shrinkage: volumetric 9.8 per cent., radial 3.9 per cent., tangential 6.4 per cent. Strength values at 12 per cent. moisture content: compressive strength (498-)(586-)(691) kg./cm.²; transverse compressive strength—tangential 5, radial 38 kg./cm.²; bending strength 1,331 kg./cm.²; modulus of elasticity 160,000 kg./cm.²; tensile strength (572-)(1,308-)(2,094) kg./cm.²; shear strength—radial 85, tangential 77 kg./cm.²; Brinell hardness—axial 130, radial 61, tangential 45 kg./cm.²; work to failure by impact 0.53 mkg./cm.². The compressive, tensile, and bending strengths are very high in relation to the specific gravity. The wood shows higher strength values in the radial than in the tangential plane.

31.21. Texture

1.21.31 : 31.22 : 12.26-8. PAUL, B. H. Variation in the porosity of twelve species of Oak. *5th Lumberm.* 64 (2063), 1942 (31-3). [Forest Products Laboratory, Madison, Wis.]

Porosity tests of the heartwood of twelve species of Oak, based on the measurement of the rate of flow of air through the wood specimens under specified conditions, gave the following species sequence in order of increasing porosity: *Q. alba*, *Q. lyrata*, *Q. nigra*, *Q. montana*, *Q. phellos*, *Q. nuttallii*, *Q. rubra*, *Q. rubra pagodaefolia*, *Q. coccinea*, *Q. velutina*, *Q. borealis maxima*, and *Q. borealis*. Upland species of the Red Oak group (*Q. rubra*, *Q. coccinea*, *Q. velutina*, *Q. borealis maxima*, and *Q. borealis*) were decidedly more porous than those from lowland areas (*Q. nigra*, *Q. phellos*, *Q. nuttallii*, and *Q. rubra pagodaefolia*), but neither an upland species planted on low land would be as porous is not known. In a few instances the wood of a species from one stand was more porous than that of the same species from another stand. The lower porosity appears to be associated with the more porous trees in all species except *Q. montana*. In *Q. lyrata* the most porous wood was found in the lower part of the tree. In the species of the Red Oak group the reverse was the case, the wood just above the stump being the least porous, with increasing porosity up to

15-20 ft. height. From that point upward there was a tendency towards a decrease in porosity in some species.

31.22. Relation to Water, Air, Gases

31.22.2. Shrinkage of wood. Forest Products Laboratory, Madison, Wis. *Mimeo.* No. 1363, 1941. pp. 2 + tbl. & gphs. P.R.

Includes a table of shrinkage values for commercially important woods grown in the United States.

31.22.2 : 31.1 : 12.25. BARKAS, W. W. Wood water relationships. VI. The influence of ray cells on the shrinkage of wood. *Trans. Faraday Soc.* 37, 1941 (535-47). [Forest Products Research Laboratory, Princes Risborough, Bucks.] L.S.

In most woods the shrinkage under drying is greatest in the tangential direction, less in the radial direction and very small longitudinally. The small longitudinal shrinkage is due to the polar properties of the cellulose fibrils lying roughly parallel to the length of the tree. The asymmetry across the grain may be accounted for by the presence of rays cells which will partially inhibit the free shrinkage of the wood in the radial direction. The paper examines this explanation quantitatively and shows that in Spruce the three directional shrinkages may be predicted with considerable accuracy if suitable values of the elastic constants are chosen for the fibres and rays cells and if the swelling pressure of the wood is used to determine the magnitude of the forces involved. *Author's summary.*

31.23. Weight. Specific Gravity

31.23 : 33.8. Methods for determining the specific gravity of wood for airplane use. Forest Products Laboratory, Madison, Wis. *Mimeo.* No. 1314, 1941. pp. 5. P.R.

The two methods described—the immersion method and the measurement method—may be used for determining the specific gravity based on weight and volume when oven-dry, as required in aircraft inspection.

31.27. Mechanical Strength

31.27 : 12.25. THUNELL, B. Über die Elastizität schwedischen Kiefernholzes. [On the elasticity of Swedish Pine wood.] *Holz* 4, 1941 (15-8). [G.g.] [Holzforschungsstelle des schwedischen Materialprüfungsamts.] P.R.

Changes in the modulus of elasticity were determined in relation to fibre direction, oven-dry weight/volume at 12 per cent. moisture content, moisture content, and temperature. The modulus of elasticity of water-saturated wood was increased by over 50 per cent. by freezing the wood.

31.27 : 12.25 : 31.23. UNION OF SOUTH AFRICA. Department of Agriculture and Forestry, Division of Forestry. Annual report for the year ended 31st March, 1941. Govt. Printer, Pretoria. 1941. pp. 18.

Static bending tests on specimens of *Pinus teocote* showed a very close correlation between modulus of rupture and true specific gravity (weight and volume at 12 per cent. moisture content) raised to the power of 1.25 (p. 15).

31.27 : 12.26-8. LATHAM, J. Strength tests of *Peroba rosa*. *Wood* 7, 1942 (95-6). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Tests on the timber of *Aspidosperma polyneuron* in

the unseasoned condition, i.e. not less than 27 per cent. moisture content, showed that, on the average, Peroba is slightly stronger and appreciably harder than British-grown Oak. However, when used as a substitute of like dimensions for timber of the strength of British-grown Oak, the Peroba in which wavy grain is present is of inferior strength up to 2×2 in. section, and must be suspect up to about 2×6 in.

31.27 : 31.0 (67.6). **Strengths of Kenya timbers.** *Bull. For. Dep. Kenya* No. 36, 1941. pp. 9.

A tabular summary of the results of tests made up to 1940 at the Public Works Department, Nairobi, and the Forest Products Research Laboratory, Princes Risborough. The data cover 30 Kenya timbers.

31.27 : 31.1. TIEMANN, H. D. **Wood and metal: certain advantages of wood compared with metal where weight is of importance.** *Sth. Lumberm.* 164 (2059), 1942 (53-4).

Weight for weight dry wood may have an advantage over solid metal in stiffness and breaking strength due to its porous structure. The weaker values of wood in direction across the grain may be largely offset by the use of plywood.

31.27 : 31.1. UGRENOVIĆ, A. Untersuchungen über die Spaltfestigkeit und ihren Zusammenhang mit dem Bau der Markstrahlen. [Investigations on cleavage strength and its relation to the structure of the medullary rays.] *Holz* 4, 1941 (26-31). [G.g.] P.R.

In tests with Beech a strong negative correlation ($k = -0.552$) was obtained between cleavage strength in the radial plane and the height of the (wide) rays. The latter tended to be the higher, the narrower the annual rings. Cleavage strength showed a strong positive correlation with the specific gravity of the wood.

31.27 : 31.1. FREY-WYSSLING, A. Über das anatomische Gefüge von technisch überbeanspruchtem Holz. [On the anatomical structure of mechanically overstressed wood.] *Holz* 4, 1941 (337-43). [G.g.] P.R.

From the investigation described it appears that the middle layer (middle lamella and primary wall) of the cell wall is the first to give way in wood overstrained by compression under steam treatment, whereas in air-dry wood the secondary cell wall offers the least resistance to compression and tension.

31.27 : 31.21.33 : 12.25 : 12.26-8. HEARMON, R. F. S., and BARKAS, W. W. The effect of grain direction on the Young's moduli and rigidity moduli of Beech and Sitka Spruce. *Repr. from Proc. phys. Soc.* 53, 1941 (674-80). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The implications of the assumption that wood possesses rhombic symmetry are discussed, particularly in relation to the effects of grain angle on Young's modulus and rigidity modulus. Simple methods, involving the frequencies of vibration of thin strips cut at the appropriate grain angle, are described to measure these effects. The experimental results agree with the calculated values as closely as can be expected for a variable and elastically imperfect material such as wood. *Authors' summary.*

31.27 : 31.22.1. **Moisture content-strength adjustments for wood.** Forest Products Laboratory, Madison, Wis. *Mimeo.* No. 1313, 1941. pp. 9 + gph. P.R.

Three general methods that may be used for moisture/strength adjustments are considered. These may differ materially in their accuracy, simplicity and facility of

application. They are referred to as (1) the approximate method, (2) the equation method, and (3) the graphical method.

31.27 : 33.4 : 33.91. GRAF, O. Aus Versuchen mit Bauholz und mit hölzernen Bauteilen. [From experiments with structural timber and timber building members.] *Holz* 4, 1941 (347-60). [G.] P.R.

Report of various tests that were carried out on beams in connexion with the preparation of German standard specifications for wooden buildings and bridges.

31.27 : 33.8. NEWLIN, J. A., and TRAYER, G. W. Deflection of beams with special reference to shear deformations. The influence of the form of a wooden beam on its stiffness and strength. I. Forest Products Laboratory, Madison, Wis. *Mimeo.* No. 1309, 1941. pp. 19. *Repr. of Report 180 of the National Advisory Committee for Aeronautics.* P.R.

31.27 : 33.8. Form factors of beams subjected to transverse loading only. The influence of the form of a wooden beam on its stiffness and strength. II. Forest Products Laboratory, Madison, Wis. *Mimeo.* No. 1310, 1941. pp. 19. *Repr. of Report 181 of the National Advisory Committee for Aeronautics.* P.R.

31.27 : 33.8. NEWLIN, J. A., and TRAYER, G. W. Stresses in wood members subjected to combined column and beam action. The influence of the form of a wooden beam on its stiffness and strength. III. Forest Products Laboratory, Madison, Wis. *Mimeo.* No. 1311, 1941. pp. 13. *Repr. of Report 188 of the National Advisory Committee for Aeronautics.* P.R.

31.3. Chemical Properties

31.3. ERDTMAN, H. Some of the recent developments in lignin chemistry. *Pulp Paper Mag. Can.* 43, 1942 (253-9). Translated by Dr. L. M. Cooke from original in *Svensk PappTidn.* 44, 1941 (243-53).

A brief survey of recent literature. Fifty-five references are quoted.

31.3. **Studies on lignin and related compounds.** XXXIX-XLV (XL not included); XLVI-L; LIII-LXIII. Collected reprints of this series from *J. Amer. Chem. Soc.* 61, 1939 (868-9; 2190-4; 2194-5; 2196-8; 2198-2203; 2204-6; 2556; 2698-2701); 62, 1940 (1412-5; 2149-54; 2803-6; 2284-8); 63, 1941 (2371-4; 3031-68). P.R.

31.3 : 12.25. HÄGGLUND, E., and LARSON, R. On the hemicellulose of Spruce wood. I. *Svensk PappTidn.* 44, 1941 (477-80). *Abstr. in Auszüge aus der Literatur—suppl. to Papierfabrikant* 40, 1942 (10). [G.] P.R.

31.3 : 12.26-8 : 31.1. FREEMAN, R. D., and PETERSON, F. C. Proximate analysis of the heartwood and sapwood of some American hardwoods. *Industr. Engng. Chem. (Anal. Ed.)* 13, 1941 (803-5). [New York State College of Forestry, Syracuse.] L.S.

Tables are given to show the results of chemical analyses of the heartwood and sapwood of Big-tooth Aspen, Beech, Sugar Maple, Fire Cherry, and Paper and Yellow Birches. Certain generalizations (not conclusions) are deduced as to the relation of sapwood and heartwood constituents, viz.:—(i) Except in Paper Birch, the ash percentage was lower in the sapwood than in the heartwood. (ii) In every case the hot- and cold-water solubility was greater in the sapwood. (iii) Except for the Birches, alcohol-benzene solubility was greater in the sapwood. (iv) No general deduction was

possible on the distribution of ether-soluble residue, pentosans, or hemicellulose. (v) Except for Aspen and Paper Birch, the acetyl content of the sapwood was the greater. (vi) Except for Paper Birch, the heartwood had the greater methoxyl residue. (vii) The heartwood of every species contained more lignin than the sapwood. (viii) Except for Aspen, the cellulose content of the sapwood was greater than that of the heartwood. (ix) With certain reservations, it is stated that, except for Aspen and Beech, the cellulose content was higher in the sapwood.

The distribution of pentosan, methoxyl and acetyl groups is briefly discussed. It is noted that in spite of a very low lignin content, the cellulose content of Fire Cherry averaged only 60 per cent. owing to the presence of a considerable hemicellulose fraction, which is now under investigation.

31.3 : 12.26-8. SPÄTH, E., and SCHLÄGER, J. Über die Inhaltsstoffe des roten Sandelholzes. 2 Mitt.: Die Konstitution des Pterostilbens. [On the constituents of 'Red Sandalwood' [*Pterocarpus santalinus*]. 2: The constitution of pterostilbene.] *Ber. dtsh. chem. Ges.* 73, 1940 (881-4). [G.] *Abstr. in Holz* 4, 1941 (116). [G.] P.R.

31.3 : 33.32. YORSTON, F. H. *Advances in the chemistry of wood 1941. Pulp Paper Mag. Can.* 43, 1942 (203-5).

A survey of the literature with particular reference to work resulting in new fundamental knowledge or indicating new methods of processing and utilizing wood and wood products.

31.3 : 33.32. STAUDINGER, H., and HUSEMANN, E. Bestimmung des Zellulosegehaltes in verschiedenen Holzsorten. [Determination of the cellulose content of various tree species.] *Holz* 4, 1941 (343-7). [G.] [Forschungsabteilung für makromolekulare Chemie des Chemischen Laboratoriums der Universität Freiburg i. Br.] P.R.

The different tree species examined differed in their cellulose content, that in *Populus nigra* being about 10 per cent. higher than in Spruce and 12 per cent. higher than in Beech. The cellulose contents of *P. canadensis*, *P. tremula*, and *P. alba* were of the same order as that of Spruce.

31.3 : 33.32. NICKERSON, R. F. *Hydrolysis and catalytic oxidation of cellulosic materials: Hydrolysis of natural, regenerated, and substituted celluloses. Industr. Engng. Chem. (Industr. Ed.)* 33, 1941 (1022-7). [Mellon Institute, Pittsburgh, Pa.] L.S.

Quantitative data on the hydrolysis of cellulosic materials in boiling 8-per-cent. hydrochloric acid are presented and discussed with special reference to the composition of such materials. Cotton and wood cellulose appear to differ in chemical structure.

31.3 : 33.32 : 31.22.2. HELLSTRÖM, N. Action of alkali upon wood. *Ing. Vetensk. Akad. Handl.* No. 1, 1941 (10-6). [Sw.] *Abstr. in Holz* 4, 1941 (369). [G.] P.R.

Measurements of the swelling of thin cross-sections of Birch wood in different concentrations of NaOH solution showed two separate ranges (up to 2 per cent., and 5-8 per cent., respectively) within which swelling was marked, and an intermediate range (2-5 per cent.) within which no conspicuous change occurred. As pure cellulose begins to swell only at concentrations of 6-7 per cent. it was assumed that this was responsible

for the second range of concentrations that caused swelling. Confirmation was obtained by tests on Birch sections from which the lignin and hemicellulose were removed: in these only the range 7-8 per cent. gave marked swelling. The swelling at concentrations below 2 per cent. is thus attributable to effects on the hemicellulose and possibly on the lignin.

31.4. *Durability. Decomposition*

31.41. Natural Durability

31.41 (91.4). AGUILAR, L. Relative durability of untreated Philippine woods. (A progress report.) *Philipp. J. For.* 4, 1941 (247-56). [Bureau of Forestry, Philippines.]

The 'grave-yard' tests described showed that there is a wide range of durability among the 182 species of Philippine woods tested. At least 10 species of local woods showed better durability than Ipil (*Intsia bijuga*), of which the average life in the testing grounds was 11 years and 6 months. These are Mancono (*Xanthostemon verdugonianus* Naves), Molave (*Vitex parviflora* Juss.), Malayakal (*Shorea seminis* (DeVries) Van Slooten), Malabayabas (*Tristania* sp.), Narig (*Vatica* spp.), Magasusu (*Hopea mindinganensis* Foxw.), Gisok (*Shorea astylosa*), Bansalagin (*Mimusops parvifolia* R. Br.), Tindalo (*Pahudia rhomboidea*), and Yakal (*Shorea gisok* Foxw.). The durability of Anubing (*Artocarpus cumingiana* Trec.) and Sasalit (*Vitex aherniana* Merr.) equalled that of Ipil. An arbitrary classification of durability was prepared and all the woods were grouped in five durability grades.

31.41 : 12.25 (410). CARTWRIGHT, K. St. G. The variability in resistance to decay of the heartwood of home-grown Western Red Cedar (*Thuja plicata* D. Don) and its relation to position in the log. *Forestry* 15, 1941 (65-75). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

It is concluded that:—(1) The resistance to decay of British-grown Western Red Cedar is of the same order as that of the imported timber. (2) Heartwood from the base of the tree examined, about 65 years old, shows little variation across the trunk in resistance to fungus attack, the timber from this region being very resistant to decay. (3) The difference in resistance to decay, both by white and by brown rots, between the outer and inner heartwood of each section becomes increasingly marked as one goes up the tree, the most recently formed heartwood being the most resistant, and the resistance decreasing in each case as the centre of the tree is approached. (4) The total average resistance of the timber across the trunk is highest in material taken from the base of the tree, and shows a progressive decrease up the tree. (5) The amount of material soluble in hot water was determined in samples taken from different positions in the trunk and the toxicity of these extracts to *Fomes annosus* was examined. In each of the cross-sections examined it was found that the amount of material extracted by hot water was greater in the outer heartwood adjoining the sapwood than in the central heartwood and that the toxicity of the extracts was correspondingly higher. The resistance to decay of the samples thus appears to be closely correlated with the amount of extractable substances present in them. In the material which was examined serious decay occurred only in wood containing less than 5 per cent. by weight of hot water extractives. (6) Samples of Canadian-grown material were also analysed

for extractives and found to contain about 6.9 per cent., a figure exceeded by some of the samples from the outer heartwood near the base of the British-grown tree. The extract from the Canadian material was, however, found to be very much more acid, having a pH of 2.2 as compared with an average figure of about 4.5 in the British-grown material. *From author's summary.*

31.42. Attack by Plant Organisms

31.42.11. BADCOCK, E. C. **New methods for the cultivation of wood-rotting fungi.** *Repr. from Trans. Brit. mycol. Soc.* 25, 1941 (200-5). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

A new culture medium is described, consisting of sawdust from a readily decayed species such as Beech or Spruce well mixed with 5 per cent. by weight of an accelerator, the principal ingredients of which are maize meal and bone meal. A wide range of species have shown exceptionally vigorous growth on this medium, and its use is suggested for laboratory tests on the resistance to decay of naturally durable timbers or timbers impregnated with preservatives. Addition of the accelerator to garden soil or to cotton wool also provides a medium on which very vigorous growth can be obtained.

31.42.11 : 38.2 : 33.36.1. ZYCHA. **Building materials and fungal attack in houses.** *Chem. Fab.* 14 (14), 1941 (271-2). *Building Sci. Abs. (n.s.)* 15, 1942 (28). P.R.

A discussion of the conditions favourable to fungal growth and of building-construction measures designed to minimize the risk of attack.

31.43. Attack by Animal Organisms

31.43 : 12.26-8 : 13.2. UNION OF SOUTH AFRICA. **Department of Agriculture and Forestry, Division of Forestry. Annual report for the year ended 31st March, 1941.** Govt. Printer, Pretoria. 1941. pp. 18.

Of many woods tested for resistance to *Lyctus* attack, only those of *Eucalyptus pilularis* and *E. cladocalyx* were immune (p. 15).

31.43 : 12.26-8 : 13.2 : 33.36.1. **Substitute timbers—a warning.** *Mon. News Lett. Div. For. Prod. Aust.* No. 120, 1942 (4).

White Cheesewood (*Alstonia scholaris*) has a wide sapwood that is susceptible to *Lyctus* attack and should not be used for other than temporary purposes without first being treated with boric acid preservative.

31.43 : 33.53 : 33.36.1 (944). JOHNSON, R. A., and MCNEILL, F. A. **Destruction of timber by marine organisms in the Port of Sydney.** *Supplementary Report No. 2.* Maritime Services Board of New South Wales, Sydney. 1941. pp. 92 + 22. L.S.

This report is a supplement to two previous reports issued in 1932 and 1936 respectively. Observations are presented on general borer activity, methods of pile preservation are considered, and the detailed history is given of two test stations not covered in the previous reports. Comparison of the activities of *Limnoria* at three adjacent test-station sites indicates irregularities of distribution and attack that make it impossible to apply evidence from one locality to the Port as a whole. Experiments and field observations have convinced the authors that *Chelura*, an associate of *Limnoria*, has no significance as a boring organism. The reaction of piles of *Syncarpia laurifolia* to sub-tidal attacks by *Limnoria* is discussed with reference to damage done

to some piling in Walsh Bay, Port Jackson. Much space is devoted to observations on and experiments with *Cobra* borers. The efficacy of marine growths as aids in the prevention of *Cobra* attacks was demonstrated experimentally. An initial record of serious damage by *Martesia* is described and details are given of methods used to combat this new pest in Port Jackson. Details are also given of the 'floating collar method' for inter-tidal treatment of piling, and of the recently developed 'plastic compound casing process' for sub-tidal preservation. A cumulative index is provided to the present and previous reports on the investigations.

31.43 : 33.53 (94). WILSON, H. B. **Resistance of Australian timbers to attack by marine borers.** *J. Coun. sci. industr. Res. Aust.* 14, 1941 (263-5). [Division of Forest Products, C.S.I.R.]

Includes a list of Australian timbers suitable for marine piling, indicating for each State the timbers available in larger quantities.

31.8. Quality and Defects of Timber

31.8. HUBERT, E. E. **Plugging knot holes in Pine lumber.** *Timberman* 43 (5), 1941-42 (12-4). [Western Pine Association, Portland, Ore.]

Various substances have been evolved for use in plugging knot holes in lumber after objectionable types of knots (loose knots and black knots) have been bored out, thus improving the lumber grade. These fillers vary in effectiveness and cost. Formulae that have given the best results so far are recorded and the qualities of and test results from the fillers are noted briefly. They all use a mixture of 14-mesh Ponderosa Pine sawdust and wood flour as the basic material held together by means of a binder.

31.8 : 22.14.2 : 12.25. CHAPEL, W. L. **Unmerchantability in second cut Ponderosa Pine.** *J. For.* 40, 1942 (45-8). [U.S. Forest Service.]

A stand of Ponderosa Pine cut over by the group selection method in 1909 was logged for the second time in 1939, when the average cut was 2,675 bd. ft. per acre, the average residual stand was 2,968 bd. ft. per acre, and total defect was 10.8 per cent., which is lower than in the first cutting. It was found that unmerchantability or defect increases directly with age and diameter of tree and decline in vigour, becoming serious only in trees of greatest age (tree class 4) and poorest vigour (class D). Technical rotations for various products harvested from this species in the south-west United States can be carried out before the trees reach these age and vigour classes.

31.8 : 56 : 12.11.3 : 12.26-8. JOHNSON, L. P. V. **Studies on the relation of growth rate to wood quality in *Populus* hybrids.** *Repr. from Canad. J. Res.* 20, Sec. C, 1942 (28-40). [National Research Laboratories, Ottawa.]

From studies on the relation of growth rate to wood quality in a series of 43 hybrid and parental trees, involving *Populus alba*, *P. grandidentata*, and *P. tremuloides*, it was found that:—(a) On the average, fibres in fast growth annual rings were longer than those in slow growth rings from the same tree. In single annual rings, fibres of early wood were shorter and thicker than those of late wood. (b) Average fibre diameter of individual trees was significantly correlated in a positive manner with growth rate, but the correlation between fibre length and growth rate was not

significant. (c) Short, thick habit of growth was significantly correlated with high density of wood, but correlations between annual volume increment and wood density were insignificant. Experimental pulp and paper tests did not show any great differences in quality between fast growing hybrid and slow growing parental trees and the general conclusion is that rapid growth has no serious effect on wood quality. *From author's summary.*

32. HARVESTING OF WOOD. LOGGING

32.2. *Felling and Related Operations*

32.25. BLAIR, G. D. *Tree clearance for overhead lines—a text-book of public utility forestry.* Electrical Publications Inc., 360, N. Michigan Ave., Chicago. 1940. Library accessions list, Lands, Parks and Forests Branch, Department of Mines and Resources, Ottawa, Dec. 1941.

32.25 : 33.02 : 12.25 : 76.1 : 22. DOWNS, A. A. *The influence of silvicultural practice on the costs of felling and bucking Loblolly Pine pulpwood.* *J. For.* 40, 1942 (37–41). [Appalachian Forest Exp. Sta.]

The silvicultural treatments included in this study were:—clear-cutting leaving 4 seed trees per acre, clear-cutting leaving 12 seed trees per acre, two-cut shelterwood, seven-inch diameter limit, light thinning from below, and heavy thinning from below. Results show that production (felling and cross-cutting) time per unit (160 cu. ft.) of pulpwood is practically the same for all methods of treatment except for light thinning, which requires 25 to 40 per cent. longer than the other methods, partly because the average size of the trees cut is smaller and partly because it is inherently slower due largely to difficulties in felling and cross-cutting in the denser stand.

32.25.2 : 07.7. Ströck. Zu: Der Mochower Fällbock. [On 'The Mochow felling trestle'.] *Forstarchiv* 17, 1941 (315–6). [G.]

Note on a trestle similar to the Mochow type [cf. *For. Abs.* 3 (315)] but of lighter construction, for use in young stands.

32.25.4. WACKERMAN, A. E. *Bucking, or log making.* *Sth. Lumberm.* 164 (2059), 1942 (49–52).

Inefficient bucking (cross-cutting) may result in volume and quality loss in lumber and also in loss of time by the crew. Good bucking practices are discussed briefly and include:—(a) full utilization of the tree; (b) adequate but not excessive trimming allowance; (c) prevention of split logs; (d) cutting forked trees just below fork; (e) jump-butting (cutting defective butt ends) and jump-cutting (cutting out defective sections from tree); (f) elimination of crook; and (g) cutting for grade.

32.26 : 07.7 : 33.06. LAMP, I. *Das Griessbeil, ein Werkzeug zum Setzen von Schichtholz.* [The 'Griessbeil', a tool for stacking cordwood.] *Forstarchiv* 18, 1942 (33–4). [G.]

The tool described comprises a handle 1.50 m. long and a steel head consisting of two spikes, each 10-cm. long. One of these is mounted in prolongation of and the other at right angles to the handle. It is claimed that the use of this tool avoids work in a bent position and generally facilitates the handling of the cordwood.

32.9. *Transport*

32.91 : 07.7. VESPER, H. G. *Lubrication of high-speed Diesel engines.* *B.C. Lumberm.* 26 (1), 1942 (66–8). [Standard Oil Company of California.]

32.91 : 07.7 : 82. *Tractor guards.* *Timberman* 43 (5), 1941–42 (71).

Brief description of a tractor guard of simple design having a frame made of $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{3}{8}$ -in. angle iron. The guard is strong, not bulky, and gives adequate protection to the operator.

32.91 : 07.7. *What you should know about wire rope.* *W. Cst. Lumberm.* 69 (1), 1942 (70–1).

Questions and answers on important points relating to the characteristics and uses of wire rope.

32.91.1. WACKERMAN, A. E. *Bunching and skidding logs.* *Sth. Lumberm.* 164 (2061), 1942 (49–52).

A brief account of methods of skidding that have been or are in use in the southern United States. In general the best method of bunching, skidding, loading and hauling logs is the cheapest and it has been shown that for skidding the cheapest method is by tractor when this is correctly and efficiently used. Such use may require the assembling or bunching of logs in loads prior to skidding or the skidding of tree lengths or multiple log lengths to be cross-cut at the landing rather than in the woods.

32.91.12 : 32.91.22 : 07.7 : 82 : 33.02. WILSON, H. M. *Mechanical woods operations for log lengths.* *Pulp Paper Mag. Can.* 43, 1942 (30–1, 29). [Price Brothers & Co., Ltd.]

Quantities of timber moved, time required, and the operating costs of truck and tractor are given for an experimental logging operation in which logs were skidded up to 1,000 ft. from felling site to sulky road, were transported by sulky (average load 618 bd. ft.) and tractor to the main hauling road, were unloaded directly into preloaders for transfer to truck (average load 1,300 bd. ft.) and trailer (average load 2,000 bd. ft.) and were transported to the river where they were unloaded by gravity. The preloader is described.

32.91.22 : 07.7. McALLISTER, J. V. *Peak log truck performance dependent on tires.* *B.C. Lumberm.* 26 (3), 1942 (36, 38).

32.91.3 : 38.4. HAFNER, F. *Zur Entwicklung der Verwendung und Bauart der Trockenriesen (Schwerkraftriesen).* [On the development of the use and construction of dry slides (gravity slides).] *Cbl. gesamte Forstw.* 67, 1941 (215–29). [G.]

A brief survey of the literature, chiefly from central Europe, on the subject. Thirty-six references are quoted.

32.96 : 07.7. WACKERMAN, A. E. *Loading logs on trucks.* *Sth. Lumberm.* 164 (2063), 1942 (49–52).

Close co-ordination between loading capacity and log production and skidding on the one hand and between loading capacity and trucking facilities on the other is an important factor in the efficiency of an operation, and loading machines that require a minimum of time to operate have a definite advantage. The author deals with loading methods as developed in the southern United States and suggests certain improvements.

33. CONVERSION AND PRESERVATION OF WOOD

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

33.10. Hand Sawing

33.10. KELLY EDWARDS, E. J. *Pitsawing*. *Bull. Dep. Agric. S. Rhod.* No. 1190, 1941. pp. 6. *Repr. from Rhod. agric. J.* P.R.

A simple, illustrated description of pitsawing operations and equipment, with a brief note on air seasoning of the material sawn.

33.15. Manufacture of Veneers and Laminated Wood. Gluing

33.15 : 01.6. *List of publications on glue and plywood*. Forest Products Laboratory, Madison, Wis. No. R513, 1941. pp. 10. P.R.

33.15. DECKER, E. E. *Cold weather hints for cold water glues*. *B.C. Lumberm.* 26 (2), 1942 (53). [I. F. Laucks, Inc.]

Dry glue should be at room temperature and water at about 70° F. when mixed. If cold lumber is being glued or work is done in a cold room the pressure period in clamps or presses should be increased, and the lumber should not be subjected to extreme changes in temperature during the gluing process.

33.15. KLEIN, L. *Phenolic resins for plywood*. *Industr. Engng. Chem. (Industr. Ed.)* 33, 1941 (975-80). [Resinous Products & Chemical Co., Philadelphia.] L.S.

The historical development of phenolic resins for plywood is traced from 1900 to the present day. The various physical forms in which the resin has been used as an adhesive are described. New products, water-soluble phenolic powders of good stability and rapid curing properties, are discussed. The use of phenolic resins as impregnants for products such as improved wood and wood with better dimensional stability is covered. Fields of application for resin-bonded plywood are briefly touched upon with special reference to aircraft construction. *From author's summary.*

33.15. HENKEL & CIE, G.M.B.H. *Adhesives for gluing wood*. *British Patent* No. 527,704, Oct. 15, 1940. *Chem. Abs.* 35 (7069). P.R.

The adhesive comprises a starch conversion product that is soluble in or yields a paste with cold water and that has been mixed with a melamine-aldehyde condensation product. Suitable ratios are 70-95 per cent. of dextrin to 5-30 per cent. of melamine-HCHO condensation products.

33.15. *A new composite material*. *Wood* 7, 1942 (99-100).

The article deals generally with improved woods and in particular with a new type known as 'Plyscol', in which the inner layers are of wood-fibre board or other fibrous materials.

33.15. GONDA, D. *Improvements in and relating to the production of laminated fibrous material*. *British Patent* No. 537,688. *Building Sci. Abs. (n.s.)* 14 (800). P.R.

A number of fibrous sheets is treated with thermo-setting synthetic resin, one or some, but not all of the sheets being perforated; the sheets are superposed so that the perforations form one or more cavities, which are then filled with mouldable thermo-setting synthetic-resin material; and the assembled materials are bonded by heat and pressure.

33.15. JERVIS, J. E. *Improvements in plyboard*. *British Patent* No. 536,772, May 27, 1941. P.R.

The specification relates to plyboard consisting of at least one layer or ply of wood and at least one layer of cardboard, strawboard, millboard, or the like, bonded with silicate of soda, and to the construction of cable reels, bobbins, or the like, comprising two end discs of such plyboard.

33.15 : 07.7. STEVENS, W. C., and TURNER, N. *Eccentric bends*. *Wood* 7, 1942 (60-1). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The paper supplements an earlier article on the production of bends using continuous strip material built up from small pieces joined end to end [cf. *For. Abs.* 1 (275)]. As a result of further work at the Forest Products Research Laboratory, Princes Risborough, the method has been modified so as to make it possible to produce with the use of simplified apparatus a much greater variety of eccentrically shaped bends not containing re-entrant curves or angles.

33.15 : 07.7. WATANABE, T. *Apparatus for the continuous production of ply-wood*. *British Patent* No. 539,267. *Building Sci. Abs. (n.s.)* 14 (799). P.R.

The apparatus comprises a number of fixed plates radially disposed around a rotating cylinder, pressing plates on both sides of each fixed plate, and wedges between every two adjacent pressing plates. The glued materials of the board are supplied one after another between the fixed plates and the pressing plates; the wedges are inserted; the boards are pressed and heated while rotating; the plywoods produced are taken out after one rotation, in order; new materials are again supplied; and the operation is constantly repeated.

33.15 : 31.22.2. GREENHILL, W. L. *The 'working' of plywood with atmospheric changes*. *Aust. Timb. J.* 7, 1941-42 (510, 538). [Division of Forest Products, C.S.I.R.]

Data on the movement of 6 ft. × 3 ft. × $\frac{3}{16}$ -in. sheets of 3-ply of different timber species with a 4-per-cent. moisture-content change.

33.15 : 33.03 : 12.26-8. Cox, H. A. *Home-grown Birch as a possible plywood timber*. *Wood* 7, 1942 (38-40). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The Forest Products Research Laboratory has recently shown that, omitting the consideration of cost of production, plywood of very good quality can be manufactured from British-grown Birch. Although Birch trees in Britain are generally unthrifty and weedy-looking, here and there good trees grow up without attention, mainly in mixture with other species, suggesting that, with proper treatment, a crop of clean, straight boles of the type required in the plywood industry might be grown. Careful observation might show whether objectionably deep fluting is an induced or inherent character and how far it may be influenced by climatic or edaphic factors. 'Pith flecking' is a serious defect, caused by the boring of the larvae of *Agromyza carbonaria* into the cambium of the living tree. Field observations would indicate those districts in which the pest was sufficiently prevalent to cause serious degrade, and might show whether it could be brought under control.

33.15 : 33.12. *Resin-impregnated wood for truck wheels*. *Mon. News Lett. Div. For. Prod. Aust.* No. 119, 1941 (1).

Wheels turned from discs built up with 80 plies of $\frac{1}{8}$ -in. veneer of *Schizomeria ovata*, vacuum impregnated with a thermo-setting cresolformaldehyde resin and pressed at 2,000 lb. per sq. in. at 300° F. giving a density of 1.39, showed a relatively long service life under particularly severe conditions.

33.15 : 33.4. **Construction glues in wood columns.** *Wood Products* 47 (3), 1942 (19).

Note on the use of water-resistant glues in the assembly of staves into wooden columns for outdoor use. Such columns are a speciality of the A. F. Schwerd Manufacturing Company, Pittsburgh.

33.15 : 33.8. **Data on the design of plywood for aircraft.** Forest Products Laboratory, Madison, Wis. *Mimeo.* No. 1302, 1941. pp. 14 + tbs. & illus. P.R.

33.15 : 33.8. **The boat without a nail.** *Mon. News Lett. Div. For. Prod. Aust.* No. 122, 1942 (2-3).

Brief note on the method of manufacture of small round bilge boats using phenol-bonded sheets of Mahogany veneers which are moulded into shape under pressure and high temperature. The 10-ft. boat weighs about 80 lb., is very strong but has no internal ribs or stringers, and has a smooth, jointless surface that cannot leak.

33.17. Sawmilling

33.17 : 07.7. **DEVER, J. F. Brazing the band saw.** *Timberman* 43 (5), 1941-42 (30).

Description of method and necessary tools and material.

33.17 : 07.7. **New type round saw sharpener.** *W. Cst. Lumberm.* 69 (1), 1942 (66, 68).

A brief note on some of the improvements included in a new automatic, circular-saw sharpener that has a capacity for saws up to 72 in.

33.17 : 32.96 : 07.7. **TELFORD, C. J. Small sawmill improvement: methods of loading lumber at the rear of the mill.** Forest Products Laboratory, Madison, Wis. No. R899-16, 1941. pp. 2 + illus. P.R.

33.17 : 33.36.1 : 07.7. **TELFORD, C. J. Small sawmill improvement: plans for small mill lumber treating equipment.** Forest Products Laboratory, Madison, Wis. No. R899-15, 1942. pp. 2. P.R.

33.17 : 38.2. **TELFORD, C. J. Small sawmill improvement: plan of semi-permanent small mill.** Forest Products Laboratory, Madison, Wis. No. R899-14, 1941. p. 1 + illus. P.R.

33.17 : 60.31.2 : 94.4. **DILLER, O. D. A cooperative sawmill project in Ohio.** *J. For.* 40, 1942 (263-4). [Ohio Agricultural Exp. Sta.]

A new type of portable sawmill, recently purchased by the Farm Bureau Cooperative Association for manufacturing timber from farm woodlands, can be set up in 30 minutes, dismantled in 15 minutes and moved from farm to farm at 30 miles per hour. Standards of manufacture compare favourably with those of the better small mills.

33.3. Chemical Treatment

33.3 : 12.25. **KHANDROS, L. M. The complete utilization of Larch.** *Lesokhim. Prom.* 2 (9), 1939 (9-11); *Chem. Zentr.* 1940, I, 1123. *Chem. Abs.* 35 (7184). P.R.

Artificial fibres and sulphite cellulose are obtained from Larch, together with 60 litres of absolute alcohol per ton. Larch contains up to 30 per cent. reducing

sugar. The root contains 8-26 per cent. of rosin, which can be used as a substitute for foreign types. The bark contains 9-10 and up to 17.65 per cent. of European and Siberian tannins, respectively. Bark can be removed from living stems without damage to the tree.

33.32. Pulp and Paper Manufacture. Plastics

33.32. **Forest Products Laboratory plastic wood.** Forest Products Laboratory, Madison, Wis. No. R1277, 1941. pp. 6. P.R.

33.32. **MIEDLER, K. Pretreatment of wood.** *British Patent* No. 529,855, Nov. 29, 1940. *Chem. Abs.* 35 (7713). P.R.

Rough pieces of wood in the form of cuttings from tree trunks, logs, or the like, of light weight in proportion to their volume, are compressed, transversely to the direction of the fibres, preliminary to their use in paper and cellulose manufacture. The pressing increases the power of the wood to absorb liquids. Specific pressures of about 100 to 150 atmospheres above atmospheric pressure may be used with particular advantage. It is preferable to use a press that works in two or more stages.

33.32 (71) : 09.1. **General and historical notes on Canada's pulpwood, wood pulp and paper industry.** *B.C. Lumberm.* 26 (2), 1942 (34, 36, 38).

33.32 (75 : 76). **BRAY, M. W. Development, problems, and possibilities of the Southern pulping industry.** *Sth. Pulp Paper J.* 4 (10), 1942 (6-10, 14, 16). [Forest Products Laboratory, Madison, Wis.]

With particular reference to possibilities for the improvement of pulp quality through research in wood selection and in the cooking, bleaching, and pulp processing, using both softwoods and hardwoods.

33.32 : 12.25. **WATANABE, M., YASUDA, T., KAWASE, K., and KIMURA, Y. Researches on mechanical wood pulp.** Pt. IV: On Howan Havasun (*Larix dahurica* Turcz.) of Manchoukuo as the raw material for ground wood pulp. Pt. V: On Yulin Sun (*Picea jezoensis* Carrière) of Manchoukuo as the raw material for ground wood pulp. Pt. VI: On Akamatsu (*Pinus densiflora* S. & Z.) of Nippon as the raw material for ground wood pulp. *J. agric. chem. Soc. Japan* 16, 1940 (599-612). [Jap.] L.S.

33.32 : 12.25. **McGOVERN, J. N., and CHIDESTER, G. H. Pulping Loblolly Pine heartwood with calcium-, magnesium-, and sodium-base sulphite liquors.** *Paper Tr. J.* 113 (16), 1941 (32-5). [Forest Products Laboratory, Madison, Wis.] P.R.

33.32 : 12.25 : 31.8. **BRAY, M. W., SCHWARTZ, S. L., and MARTIN, J. S. Sulphate pulping of Douglas Fir. Effect of growth variables on yield and pulp quality, III.** *Tech. Assoc. Papers* 23, 1940 (232-8). [Forest Products Laboratory, Madison, Wis.] L.S.

Four normal growth types of Douglas Fir, consisting of wood of rapid and slow growth rates from top, middle, and butt portions of both young and old trees, have been evaluated for their physical and chemical properties, and these properties have been correlated so far as possible with yield and pulp quality. The young-growth material gave the highest yields of screened pulp. Regardless of age, the highest tearing strength was given by pulps made from the more rapidly grown wood and the highest tensile strength

from the wood of slower growth. Although position of bolt in the tree had no effect on average weight yields of pulp, volume yields decreased in proceeding upward from the butt of the trees. Top bolts for all 4 growth types produced pulps of maximum bursting and tensile strengths. Although 3 out of 4 of the growth types examined gave higher tearing strength for pulps prepared from middle logs, average values for this property showed a decrease in progressing upward from the butt of the trees. *From authors' summary.*

33.32 : 12.25. CHIDESTER, G. H., and MCGOVERN, J. N. **Sulphite pulp from Douglas Fir.** *Paper Tr. J.* 113 (9), 1941 (34-8). [Forest Products Laboratory, Madison, Wis.] P.R.

Results are given for sulphite cooks of Douglas Fir, using Ca-, Na-, NH_4 -, and Mg-base liquors. Wood factors had a considerable effect on pulping; thus sapwood was readily pulped whereas heartwood was not, seasoned wood pulped more easily than green wood, old wood of slow growth was more difficult to reduce than young rapidly grown wood, the top portions of trees gave lower screenings and pulps with lower bleach requirements and tearing resistances than did lower portions, and $\frac{1}{4}$ -in. were more suitable than $\frac{5}{8}$ -in. chips.

33.32 : 12.26-8. RICHTER, G. A. **Cellulose from hardwoods: wood pulp purification.** *Industr. Engng. Chem. (Industr. Ed.)* 33, 1941 (1518-28). [Brown Co., Berlin, N.H.] L.S.

Unbleached hardwood pulps can be processed to yield substantially white products that possess properties and chemical composition suitable for esterification and for conversion into stable papers. Means are given for the elimination of resinous bodies and for the extraction of pentosans and non-alpha-cellulose constituents. *From author's summary.* [Cf. *For. Abs.* 3 (320).]

33.32 : 12.26-8 (59.3). SHIKATA, M., KIMURA, Y., NAKAMURA, K., and HACHINOE, S. **Chemical researches on the pulp woods of Siam. Part I.** *J. agric. chem. Soc. Japan* 17, 1941 (6-8, 37-46). [Jap.e.] [Kyōto Imperial University.] L.S.

Data are presented on the physical properties, chemical composition, and yield and analysis of unbleached Ca-sulphite pulps of *Broussonetia papyrifera*, *Anthocephalus cadamba*, *Niebuhrria siamensis*, *Hibiscus* sp., *Grewia* sp., *Spondias mangifera*, *Ficus* spp., *Dalbergia* sp., *Bombax* spp., *Streblus asper*, *Sterculia* sp., *Milletia* sp., and *Ailanthus* sp.

33.32 : 12.26-8 : 31.3 : 31.1. KIENTZ, G. A., and KLAUDITZ, W. **Über die anatomisch bedingten Unterschiede der chemischen Zusammensetzung und der papiertechnischen Eigenschaften des Buchennatronzellstoffs.** [On differences in the chemical composition and papermaking properties of Beech soda pulp as related to wood anatomy.] *Holz* 4, 1941 (89-92). [G.g.] [Chemisch-technologisches Institut der Reichsanstalt für Holzforschung, Eberswalde.] P.R.

These are due to differences in the chemical composition of different types of cells in Beech wood, and are shown to exist in soda pulp as well as in sulphite pulp, though they have a somewhat less disturbing effect in the former. In the soda pulp investigated, medullary ray cells differed from the rest (chiefly vessels and sclerenchyma cells) notably in that they

had a higher lignin and pentosan content, were more soluble in alkali, and furnished a considerably less solid type of paper.

33.32 : 12.26-8. BRAY, M. W., and MARTIN, J. S. **Pulping Sweetgum by alkaline processes. I. Effect of cooking variables on yield and pulp quality.** *Paper Tr. J.* 113 (25), 1941 (35-46). [Forest Products Laboratory, Madison, Wis.] P.R.

The experiments showed that Sweetgum (*Liquidambar styraciflua*) was very easily fiberized to produce a bleachable pulp of comparatively high yield and with properties suitable for a wide variety of high-grade white papers. Although the soda process can be satisfactorily applied to this species, the sulphate process or the soda-sulphur process gave superior results both in yield and bleach economy. *From authors' summary.*

33.32 : 12.26-8. PENNSYLVANIA. **Science for the farmer: 54th annual report of the Pennsylvania Agricultural Experiment Station for the fiscal year ended June 30, 1941.** *Bull. Pa. agric. Exp. Sta.* No. 414, 1941. pp. 63. A.P.B.

Work with Chestnut Oak (*Quercus montana*) has shown that faster growing trees produce pulp with better fibre characteristics and usually produce a higher yield of pulp per unit volume of wood than slower growing trees, and that no positive correlation could be found between the number of growth rings per inch and the specific gravity of the wood (p. 21).

33.32 : 33.02 : 31.8. WEGELIUS, T. **Quality of pulpwood and its effect on the manufacturing process and yield in the preparation of mechanical wood pulp.** *Finnish Paper Timb. J.* 23, 1941 (96-110). *Chem. Abs.* 35 (7184). P.R.

The branch wood from Finnish Spruce varies from 1.5 to 6 per cent. Branch wood and intergrown wood increase grinding time and necessitate repeated sharpening of the pulpstones. Small annual-ring width and a high proportion of summerwood also increase the grinding time. Branch wood and summerwood require a greater power factor. The amount of splinters and undefibred wood is proportional to the amount of branch wood.

33.32 : 33.02 : 32.4 : 52.43.2. MARTIN, J. V. **Evaluation of pulpwood.** *Tech. Assoc. Papers* 23, 1940 (456-63). [Munising Paper Co., Munising, Mich.] L.S.

A method for evaluating the physical properties of pulpwood, consisting generally of peeled Spruce and Balsam, at a cost of 7.5 c. per cord of total shipment, has been found to yield data of satisfactory accuracy. Ten per cent. of the logs, obtained by withdrawing every tenth log, are used for test purposes. The tests yield information on (i) solid content per cord, (ii) density in lb. of moisture-free wood per cu. ft. of green volume, (iii) percentage moisture in the wood, (iv) weight of wood per cord as received, and (v) the cull factor. *From author's summary.*

33.32 : 33.02 : 32.82. RIOUX, L. J., and BARSALOU, M. J. **Some observations on the effect of wood stain on pulp cleanliness.** *Pulp Paper Mag. Can.* 43, 1942 (151-2). [Fraser Companies Ltd., Edmundston, N.B.]

The cambium layer of green wood has been shown to be a serious source of dirt in unbleached sulphite and groundwood pulps, particularly if the wood has been long in storage. In order to avoid this type of dirt the

period of storage should be as short as possible or alternatively the bark should be removed prior to storage. A further suggestion is that the wood be piled in tiers so as to be thoroughly dried by the circulating air.

33.32 : 34.6 : 31.3. NORWOOD CHEMICAL Co. **Lignin.** *British Patent* No. 528,921, Nov. 11, 1940. Chem. Abs. 36 (655). P.R.

Process for recovering lignin from finely divided lignin/cellulose in liquid mixture by treatment with dilute H_2SO_4 under heat and pressure.

33.32 : 34.6 : 32.82. VENEMARK, E. **Points of view on the production of by-products in the manufacture of sulphate pulp.** *Tekn. T. (Kemi)* 71, 1941 (90-2). *Abstr. in Auszüge aus der Literatur—suppl. to Papierfabrikant* 40, 1942 (11). [G.] P.R.

The possibilities of producing by-products, chiefly fluid resin and crude turpentine, are reviewed and the importance of the condition of the wood is stressed. In contrast to air storage, water storage does not materially lower the yield of by-products. The yield of such products, and particularly of resin, is subject to seasonal variation. For the greatest possible utilization of its fat, resin, and turpentine contents, the wood should be stored in winter as freshly cut as possible and taken from storage in July–August at the earliest, in order to avoid rapid drying-out at midsummer and oxidation at high temperatures; this procedure secures a gain of about 15 kg. of resin and 2 kg. of turpentine per metric ton.

33.36. Preservation of Wood. Seasoning and Drying

33.36 : 33.15 : 33.8. MOORE, G. E., and HARKOM, J. F. **Moisture-excluding coatings for plywood for wooden aircraft.** *Forest Products Laboratories of Canada, Ottawa.* 1941. pp. 8. P.R.

Information presented is based on a review of the published literature on work undertaken at the U.S. Forest Products Laboratories. It is recommended that where possible aluminium powder should be incorporated in the liquid finish shortly before use at the rate of 2–2½ lb. per Imperial gallon. Synthetic resin varnishes are superior to spar varnish or spirit varnishes either when used alone or as a vehicle for aluminium powder.

33.36 : 33.31. I. F. LAUCKS INC. **Treating wood surfaces.** *British Patent* No. 518,461, Feb. 27, 1940. Chem. Abs. 35 (7680). P.R.

Wood surfaces are impregnated with a thin solution of a polymerized β -eleostearic acid compound dissolved in a non-aqueous miscible volatile solvent. The solid content of the solution is less than 40 per cent. and the viscosity is between 50 and 100 sec. (Saybolt) 70°. The treatment prevents raising of the grain.

33.36 : 33.36.1. MOLL, F. **Painting over carbolineum.** *Farben-Chem.* 11, 1940 (101–2). Chem. Abs. 35 (8319). P.R.

Successful painting of wood impregnated with tar or the like requires the application of a primer not penetrated by the tar. Suitable primers are solutions of resins (e.g. shellac) applied as a very thin coat, or specially formulated A1 paints.

33.36.1. Preservation against Attack by Plants and Animals

33.36.1 : 31.42.11 : 12.26–8. FINDLAY, W. P. K. **The prevention of decay in Beech.** *Wood* 7, 1942 (37–8). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

When dealing with timbers such as Beech, which are liable to deteriorate rapidly if left lying in woods during the summer months, the rate of felling should be regulated so that as far as possible logs are not left lying for more than a very few weeks during these months.

33.36.1 : 31.43. **Sterilisation of logs.** *Aust. Timb. J.* 7, 1941–42 (515, 539).

Heat sterilization of borer-infested imported logs is recommended for preventing the importation into Australia of new dangerous species of pin-hole borers.

33.36.1 : 31.43 : 07.7. HILL, W. B. **Apparatus for applying insecticidal liquids to wooden portions of buildings, &c.** *U.S. Patent* No. 2,246,731, June 24, 1941. Chem. Abs. 35 (6418). P.R.

Various structural and operative details.

33.36.1 : 31.43 : 13.2 : 33.31. BECKER, G. **Prüfung der vorbeugenden Wirkung von Holzschutzmitteln gegenüber Eiablage und Eientwicklung sowie als Berührungs- und Atmungsgift gegen Eilarven des Hausbockkäfers.** [Tests on the preventive effect of wood preservatives against oviposition and egg development and as contact and respiratory poisons against young larvae of *Hylotrupes bajulus*.] *Holz* 4, 1941 (7–14). [G.] [Staatliches Materialprüfungsamt Berlin-Dahlem.] P.R.

In tests with 21 preservatives, oviposition and embryonic development were generally not prevented. However, oil preservatives when in direct contact with the eggs brought about a change in the egg shell which prevented the emergence of the larvae. With one exception, inorganic preservatives were practically ineffective as contact and respiratory poisons against young larvae. Better results were obtained with oil preservatives. It is not known how long oil preservatives can exert the beneficial effects observed in the tests.

33.36.1 : 31.43 : 13.2. SCHULZE, B. **On the action of wood preservatives for the extermination of the longhorn beetle and *Anobium*.** *Chem. Fab.* 14 (14), 1941 (272). *Building Sci. Abs. (n.s.)* 14, 1941 (960). P.R.

A review of extensive comparative tests of the effect of various preservatives.

33.36.1 : 31.43 : 13.2. DAVIS, J. J. **The prevention and control of termites.** *Ext. Bull. Purdue Univ.* No. 225, (revised ed.) 1941. pp. 12. [Purdue University Agricultural Exp. Sta.]

With special reference to conditions prevailing in Indiana.

33.36.1 : 31.43 : 13.2 : 45.3. JENKINS, C. F. H. **Termites or 'white ants'.** *J. Dep. Agric. W. Aust.* (2) 18, 1941 (22–6). R.A.E. A30 (1034).

Notes on earth-dwelling termites, which include the species that cause most damage in Australia, and on preventive and control measures. If possible, resistant timber should be used for building and fences, and building or planting sites should be cleared of stumps, roots, and wood likely to harbour termites. Badly infested trees should be removed; others should be injured as little as possible, since dead roots or wounds near the ground encourage attack. Buildings should

have as little timber as possible in contact with the soil, and that should be properly treated. Timbers supporting floors should be capped with metal. Protection may be afforded by treatment with coal-tar creosote, either by vacuum treatment or by dipping, painting, or spraying. Better penetration results from soaking the wood for some hours in heated creosote than from a cold dip. If the timber is not exposed to wet conditions, a solution of sodium arsenite (1 lb. in 2 gal) or white arsenic may be used. In infested buildings in dry situations the best control is obtained by blowing finely ground white arsenic, Paris green, or sodium fluosilicate into cracks or holes bored in the timber which should then be plugged and left undisturbed for at least a month. The amount of dust to be injected depends on the size of the timber, but 1 oz. should suffice for 20-30 holes. The nest should be dug up if possible and drenched with creosote, and ground that may be infested should be soaked with creosote, creosote and kerosene, sump oil, or with saturated solutions of copper sulphate or borax, unless the soil is to be cultivated. Lightly infested trees can be preserved by injecting poison dusts into plugged holes in the trunk and branches. If roots of a plant are attacked, 2 oz. of paradichlorobenzene should be scattered in a trench 3-4 in. deep and 6-9 in. from the base of the plant, and the trench should be filled in. This treatment is useless, however, in soil saturated with water. Poison baits may be used in conjunction with other methods, e.g. a bait made by heating together 1 lb. of molasses and 4 oz. of sugar and adding 1 oz. of sodium arsenite dissolved in half a cup of boiling water, should be smeared on softwood boards that are attractive to termites, two boards with the treated sides touching being buried in the ground where termite activity is suspected.

33.36.1 : 33.31. **The eighth annual report [1940-41] of inspection of preservatives in the Mississippi State Highway Department's test garden.** Jackson, Mississippi. 1941. pp. 24.

33.36.1 : 33.31. JENET, J. **Creosote.** *British Patent* No. 523,609. *Chem. Abs.* 35 (6418). P.R.

The product for wood preservation comprises heavy creosote, light-oil distillate of coal tar containing phenol and naphthalene, crude benzene, and coal tar freed of H_2O and ammoniacal liquor intimately mixed in their cold state to form a liquid of high density.

33.36.1 : 33.31. LIESE, J., and SCHUBERT, R. **Beiträge zum Osmose-Holzschutz-Verfahren.** [*Contributions on the osmose process for wood preservation.*] *Holz* 4, 1941 (93-101). [G.g.] [Forstliche Hochschule Eberswalde.] P.R.

In the laboratory tests described comparative data were obtained on the penetration into Pine sapwood of a U-salt containing arsenic and of sodium fluoride, both applied as thickly as possible under favourable moisture conditions, using (a) freshly felled wood and (b) air-dry wood that was soaked with water just previous to the treatment. In the small-dimension specimens tested, penetration was greater in the freshly felled wood in all directions except radial; radial penetration was greater in the air-dry, water-soaked wood. The addition of a colloidal substance to the preservatives almost invariably reduced the final depth of penetration in all directions.

In field tests with freshly felled round timber under normal treatment conditions using 4 kg./solid cu.m. of

the U-salt, of NaF, or a mixture of both, penetration was the higher, the greater the NaF content of the preservative, and in all cases it was greater in Pine than in Spruce and greater in the latter than in Beech. Satisfactory penetration depended on adequate stacking and covering of the freshly treated timber. The average penetration of the U-salt was 2 cm., the concentration being such that attack by *Lenzites abietina* and *Coniophora cerebella* was precluded.

33.36.1 : 33.31. IKERT, B. **Die Fluorbestimmung in der Holzkonservierungstechnik. II. Die Bestimmung des Fluors im Holz.** [*Fluorine determination in the technique of wood preservation. II. Determination of fluorine in wood.*] *Chemiker-Ztg.* 63, 1940 (754-5). [G.] *Abstr. in Holz* 4, 1941 (44). [G.] P.R.

The wood is finely divided, saturated with calcium acetate and chromous acetate, and ashed in the presence of quartz meal, care being taken to see that the charcoal does not burn freely. The residue is placed in a 100-c.c. fractionating flask with dilute sulphuric acid and distilled to drive off the silicofluoric acid, the distillate being led into 30-per-cent. caustic soda solution. Distillation is continued until the charcoal on the walls of the flask is completely broken down. The caustic soda solution is then cooled and neutralized with hydrochloric acid, and the silicofluoric acid is precipitated in the usual manner as potassium silicofluoride. Instead of this gravimetric method, Willard and Winter's method of titration with $\frac{1}{1000}$ thorium nitrate solution may be used to determine the silicofluoric acid and is accurate enough for technical analyses. Fluorine determination takes 7-8 hours by the titration or 11-12 hours by the gravimetric method.

33.36.1 : 33.31 : 33.36.2. PHILLIPPS, A. E. **Preserving wood.** *British Patent* No. 516,406, Jan. 1, 1940. *Chem. Abs.* 35 (6418). P.R.

A solution for preserving wood from decay and insects and for rendering it fire-resistant contains NaF, $ZnCl_2$, H_3BO_3 , $CuSO_4$, As pentoxide and K dichromate.

33.36.1 : 33.31 : 82. HUMPERDINCK, C. **Erfahrungen mit neuen Holzimprägnierungsmitteln.** [*Experiences with new substances for wood impregnation.*] *Reichsarb. bl.* 19 (N.F.) (2), 1939 (III 44-5). *Abstr. in Holz* 4, 1941 (370-1). [G.] P.R.

Preservatives such as Basilit, Rebkolit, Triolith, etc., containing substances such as arsenates, dinitrophenol, potassium bichromate, and fluorine compounds, may cause various diseases due to poisoning. Their effects are influenced by personal constitution and addiction to alcohol. Arsenic and dinitrophenol in combination are especially dangerous. Most of the injuries are caused by irritant effects on the skin and mucous membranes; chronic injuries have not yet been observed. Preventive measures include the development of closed treating apparatus, improvement in transport arrangements, satisfactory maintenance of clothing, adherence to the manufacturers' instructions, and good facilities for washing.

33.36.1 : 33.4 : 12.26-8. **Increasing the life of Brush Box decking.** *Leaflet. N.S.W. For. Comm. Div. Wood Tech.* No. 4, 1940. pp. 4.

Brush Box (*Tristania conferta*) is commonly used in Australia for bridge and wharf decking, and has generally proved resistant to decay except at the points where the decking rests on the girders, since it is here that moisture tends to accumulate. The method of

protection recommended consists in placing thin strips of creosoted softwood between the planks and the bearers. For further safety, additional treatment may be given every two, or three years by forcing fresh creosote with a spray gun between the points of contact.

33.36.1 : 33.51. WILSON, H. B., and GREGORY, J. N. A quantitative investigation of the steeping method for the preservation of timber. A modern application of an old process to Australian mine timbers. *J. Coun. sci. industr. Res. Aust.* 14, 1941 (281-7). [Division of Forest Products, C.S.I.R.]

Treatment of sapwood of green Messmate (*Eucalyptus obliqua*) by immersion in cold aqueous solutions of zinc chloride and copper sulphate gives penetrations and absorptions of the order required for preserving the wood under service conditions in mines. A very high concentration, amounting probably to several pounds of chemical per cu. ft., is rapidly built up in the outer $\frac{1}{8}$ -in. layer of the sapwood. It is probable that immersion in a cold 5-per-cent. solution of zinc chloride or copper sulphate for one week would give sufficient protection for timber requiring a short service life, while greater absorptions could be easily obtained by the use of longer immersion periods and more concentrated solutions.

33.36.1 : 33.52. Report of 32nd annual inspection of C., B. & Q.R.R. experimental ties. *Wood Pres. News* 20, 1942 (1-4). P.R.

33.36.1 : 33.52. BLUM, B. Service rendered by various species of tie timber in the Northwest. *Wood Pres. News* 20, 1942 (21-4). [Northern Pacific Railway Co.] P.R.

33.36.1 : 33.53 : 31.43. JOHNSON, R. A. Resistance of Australian timbers to marine borer attack. *Aust. Timb. J.* 7, 1941-42 (561). [Maritime Services Board, Sydney.]

Note on a plastic compound composed of crude tar, cement, and sand, which is used for casing piles or parts thereof below the low-water mark, as a protection against shipworms and Pholads. The compound is packed between the pile and a cylindrical shield of galvanized iron or similar material. The compound can also be used for plugging holes in the piles.

33.36.2. Fireproofing

33.36.2. STERN, E. Fire-retarding treatment of wood. *Manufacturing Chemist, London* 13, 1942 (31-4). L.S.

A review of literature, including some patents, on fire-retardant preparations for impregnating or coating wood.

33.36.2 : 33.31. SOCIÉTÉ DE PRODUITS IGNIFUGES. Fireproofing material. *French Patent* No. 849,701, Nov. 30, 1940. Chem. Abs. 35 (7742). P.R.

A mixture of oxalic acid: Al_2SO_4 10 and $(\text{NH}_4)_2\text{SO}_4$ 25 parts is used as a fireproofing agent to be introduced in varnishes.

33.36.2 : 33.31. KAUFMANN, F. Über die Prüfung von Flammenschutzmitteln. [On the testing of flameproofing agents.] *Bautenschutz* 11, 1940 (53-6). [G.] *Abstr. in Holz* 4, 1941 (44-5). [G.] P.R.

In comparative experiments on the value of different tests for flame-proofing preparations the DIN4102 method and Schlyter's method were found to be unsatisfactory, while results from the fire-tube and lattice-screen tests were better and showed good agreement. The last-named test is to be adopted in the revised edition of DIN4102.

33.36.2 : 34.6 : 33.31. MCCARTHY, J. L. Decreasing the combustibility of sawdust: relative effectiveness of certain chemicals. *Industr. Engng. Chem. (Industr. Ed.)* 32, 1940 (1494-6). [University of Idaho, Moscow.] L.S.

The fire-tube apparatus of Truax and Harrison has been modified in such a manner that the fire resistance of sawdust samples can be reproducibly and rapidly determined. Western White Pine has been impregnated with various quantities of several chemicals, and their relative efficiencies in decreasing the combustibility of the sawdust have been determined. The decreasing order of effectiveness of the chemicals studied (based on loss in weight of the sample during the test) is as follows:—diammonium phosphate, borax, monoammonium phosphate, zinc chloride, ammonium sulfate, ammonium chloride, and magnesium chloride. The first 4 are effective in moderately small amounts (8-10 per cent.) and may be used to fireproof sawdust. Larger amounts of ammonium sulfate and ammonium chloride are required; magnesium chloride is not suitable as a fire-retarding agent. Whereas borax is a relatively good fire-proofing agent when impregnated into sawdust, it is without effect when simply mixed in the dry form with the sawdust. *Author's summary.*

33.36.3. Seasoning. Drying

33.36.3 : 07.7 : 33.6. REHMAN, M. A., and KAPUR, I. K. An indirect-heated, internal-fan furnace kiln (blower-cum-furnace kiln) for drying packing-case timbers. *Indian For. Bull.* No. 98, 1941. pp. ii + 7 + plate. [Forest Research Institute, Dehra Dun.]

The kiln described was designed for the seasoning of packing-case timbers. Hot gases from a wood furnace are used for heating air, which is then circulated through the kiln, the circulation being rendered very rapid by means of an internal fan. Results obtained with $\frac{3}{8}$ -in. planks of Semul (*Bombax malabaricum*) and Bhelu (*Tetrameles nudiflora*) indicate that this type of kiln is suitable for the seasoning of light non-refractory hardwood planks. The time taken for drying the planks from a green condition to 10 per cent. moisture content was about 36 hours, which is not more than that taken for drying such timber in a steam-heated kiln. Initial outlay and operating costs are less than for a steam-heated kiln.

33.36.3 : 31.8. STEVENS, W. C., and JOHNSTON, D. D. End splitting in sawn timbers. *Wood* 7, 1942 (96). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

A brief discussion of the causes of end splitting and its prevention by means of cleats or end coatings. A coating called 'filled hardened gloss oil', which was developed at the Forest Products Laboratory, Madison, is specially recommended.

33.36.3 : 31.8 : 33.8. Kiln-drying defects [in aircraft stock]. Forest Products Laboratory, Madison, Wis. *Mimeo.* No. 1369, 1941. pp. 2 + plate. P.R.

Brief notes on surface checks, honeycomb, collapse, brashness, and casehardening.

33.36.3 : 33.36.1 : 31.42.12. IRSA, G. I. DE. Method of drying green wood and for preventing the blue colouration of Pine wood. *British Patent* No. 539,675, Sept. 19, 1941. pp. 3. P.R.

Specification of a process that consists essentially in subjecting the wood to heat treatment in a sealed chamber where it is completely immersed in water,

followed by dry steam and vacuum treatments. Subsidiary claims relate to additional steps such as sterilization with inert gases, waterproofing, and preservation against insect attack.

33.36.3 : 33.8. **Air-seasoning aircraft stock.** Forest Products Laboratory, Madison, Wis. *Mimeo.* No. 1366, 1941. pp. 3. P.R.

Rules are given for the proper seasoning of lumber, with reference to stain prevention, foundations, air flues, stickers, placing of lumber, end coatings, covering, and site.

33.37. Distillation. Manufacture of Tar

33.37. RAZOUS, P. **Carbonization and distillation of wood in the factory.** *Gén. civ.* 118 (61), 1941 (1-7); *Chem. Zbl.* 113, I, 1942 (699). *Fuel Res. Summ.* 1942 (153-4). P.R.

An account is given of the chief methods used at the present time, with special reference to the separation of acetic acid from crude wood vinegar. The Suida and the Usines de Melle extraction processes, as well as the azeotropic distillation by the Soc. des Prod. chim. de Clamecy and the Etabl. Lambiotte at Premery are described.

33.37 : 07.7. BERGSTRÖM, H. Framställning av B-tjära vid kolning av trä. [Production of 'B-tar' during wood carbonization.] *Jernkontorets Annaler* 125, 1941 (650-2). [Sw.] P.O.

'B-tar' is largely water-soluble and occurs in crude pyroligneous acid, from which it can be obtained as a residue on evaporation. It has hitherto been utilized only in exceptional cases, and then only as a binding agent, e.g. for briquettes. Under the present circumstances, however, greater possibilities are developing for its utilization not only in briquetting but also as a raw material, in combination with 'A-tar', for the manufacture of further tar products. Evaporation of pyroligneous acid is an uneconomic method of recovering 'B-tar': a simpler method is to obtain the tars direct by washing the retort gases in a scrubbing tower, the condensate being led to a vessel where it separates into an upper layer of 'A-tar' and a lower layer of about 50-per-cent. 'B-tar' solution. Scrubbing also has the advantage that the gases are cleaner when recovery of other volatile products is effected. The yield of 'B-tar' varies widely and is the greater the more rapid the carbonization. From coniferous wood the yield is reckoned at 10-16 kg. per cu. m. stacked measure. The lay-out of a suitable plant is illustrated diagrammatically.

33.37 : 33.38. CEDERQUIST, K. **Wood carbonizing industry.** *Svensk. kem. Tidskr.* 53 (5), 1941 (Suppl. 48-50); *Chem. Zbl.* 113, I, 1942 (699). *Fuel Res. Summ.* 1942 (154). P.R.

A general survey of recent progress in technique, with special reference to the recovery of organic compounds, yields of charcoal, liquid and gaseous products from the carbonization of coniferous wood and possibilities of further treatment.

33.37 : 33.38. ZOLLIKOFER, H. Holzgas- und Holzkohlenherstellung in Gaswerken; Eignung von Gaswerks-Holzkohle für den Automobilbetrieb. [Wood-gas and wood-charcoal manufacture in gasworks; suitability of gasworks charcoal for producer-gas vehicles.] *Monatsbull. schweiz. Ver. Gas- u. Wasserfachm.* 21, 10,

11, 1941 (170-82, 195-200). [G.] *Ibid.* 21, 12, 1941 (207-24). [F.] P.O.

Experiments at the Horgen gasworks with various hardwoods—mainly Beech—and with Norway Spruce and Scots Pine have shown that dry wood will give good yields of gas of good calorific value. Very high gas yields were obtained by a modified process in which charcoal from the first charge was pushed to the end of the retort to form a glowing layer where the CO₂ in the gas from the succeeding charges was reduced to CO and the steam to water gas. The wood tar obtained had good physical properties. Road tests indicated that the charcoal obtained from Beech wood was eminently suitable for use in producer-gas vehicles, though the coniferous charcoals were less satisfactory and are not recommended for this purpose except in mixture with hardwood charcoal. Details are given on gas and charcoal yields and composition, weights per charge of the various materials compared with those for coal, apparatus and procedure for carbonization, and tests of the charcoals in producer-gas vehicles.

33.37 : 33.38. SCHENKER, M. **Total distillation of wood.** *Monatsbull. schweiz. Ver. Gas- u. Wasserfachm.* 21, 1941 (17-26). *Chem. Abs.* 35 (8257). P.R.

Wood was carbonized and gasified in 2 batteries of 4 and 5 vertical ovens of 2.5 cu. m. capacity. The floor was covered with charcoal, 1 ton of wood charged, and this covered with charcoal. The flue temperature was 1,150° and the carbonizing time 4 hours. After complete carbonization, another 1.5 cu. m. of wood was charged on top of the charcoal. Steam was introduced through two 5-mm. orifices, 0.8 kg./sq. cm. pressure, 300° superheat, 20 kg. steam per hour per jet. Every 2-3 hours an additional 200 kg. of wood was charged and this process continued for a week in the same oven chamber. Yields from coal and wood compare as follows:—Per 100 kg. coal are obtained (without steam) 52.9 cu. m. gas of 4,200 cal. per cu. m. and 0.41 kg. benzene. Per 100 kg. wood is obtained 168 cu. m. gas of 2,900 cal. by total gasification (gravity of gas 0.65). The underfire required for the wood is 30.5 kg. coke per 100 kg. wood. The total cost of production is estimated at 1.05 Swiss Rp. for coal gas and 1.50 Rp. for wood gas. The average composition of the combined charcoal water-gas and wood-distillation gas is CO₂ 12.6, illuminants 0.4, O₂ 0.6, CO 32.0, H₂ 42.1, CH₄ 4.4, N 7.9 per cent.; no AcOH was found in the wood gas. Carbonization of wood without gasification of the charcoal is uneconomical. Beech wood is preferred.

33.37 : 33.38. L'AMKIN, V. A., and NEMKIN, A. S. **On the yields of gas and of by-products in the gasification of wood of different tree species.** *Lesokhim. Prom.* 3 (3), 1940 (40-5). [R.] *Abstr. in Holz* 4, 1941 (118). [G.] P.R.

Laboratory experiments on the gasification of Birch, Aspen, Pine, and Fir wood (9-11 per cent. moisture) gave yields of 17.716, 15.98, 15.77, and 16.881 per cent., respectively, of gas; 25.93, 26.42, 26.28, and 29.03 per cent. of charcoal; 8.04, 5.18, 4.21, and 3.51 per cent. of organic (acetic, formic, and propionic) acids; and 23.32, 26.68, 29.2, and 25.1 per cent. of tar. In larger-scale gasification of wood considerably higher gas yields and lower yields of by-products were obtained, due to the higher moisture content (35-50 per cent.) of the wood; the yields from Birch and Fir wood were respectively 1.44 and 1.61 (as against 0.136 and

0.133) cu. m. of gas per kg. of dry wood substance, 18.6 and 22.6 per cent. of tar, 1.63 and 0.69 per cent. of methyl alcohol, and 7.83 and 3.4 per cent. of organic acids. The gas had calorific values of 1,440–1,503 and 1,385–1,442 kcal./cu. m. respectively, but a rather different chemical composition from that in the laboratory experiments, owing to the moisture content of the air introduced during gasification.

33.37 : 33.38. MALIKOV, K. V. **Gasification of wood stumps in the coal generator.** *Ural Met.* 8 (8), 1939 (35–7); *Chem. Zentr.* 1940, I, 2264. *Chem. Abs.* 35 (7686). P.R.

Damp wood stumps (water content up to 50 per cent., length up to 250 mm.), placed in a layer 2.5 m. deep, were subjected to gasification in a coal generator. The gas obtained was superior to that produced by gasification in the usual wood generator.

33.37 : 34.6. SVIRIDOV, N. **The utilization of wood chips in the Kombinat of Kamsk.** *Bumazhnaya Prom.* 17 (7), 1939 (43–5); *Chem. Zentr.* 1940, I, 1454. *Chem. Abs.* 35 (6421). P.R.

Wood waste such as sawdust or bark was cut fine, subjected to preliminary drying, and then heated to 300–400°, at which temperature the material was pressed into briquettes in a few seconds and without the use of a binding agent. Dry distillation takes place and valuable by-products are obtained in addition to the briquettes.

33.37 : 34.6. SLAVYANSKY, A. K. **Thermal decomposition of wood shavings with the vaporization of organic substances.** *Lesokhim. Prom.* 2 (9), 1939 (42–8); *Chem. Zentr.* 1940, I, 1454. *Chem. Abs.* 35 (6421). P.R.

Experiments on the pyrolysis of wood in superheated or saturated petroleum, benzene and xylene vapours gave higher yields of products than the usual dry distillation.

33.37 : 34.6 : 33.38. LINDEN, A. VAN DER. **Gas manufacture from wood scrap.** *Het Gas* 61, 1941 (60–1). *Chem. Abs.* 35 (8254). P.R.

Results are given from laboratory tests on the distillation (Geipert type apparatus) of wood scrap for gas and charcoal. The distillation temperatures were 800°, 950° and 1,100°. Calculated on dry substance (moisture content was 50.5 per cent.) the gas yield varied from 226 to 551 cu. m. per ton, calorific value from 3,650 to 4,480, coke yield 13.6 to 11.5 per cent., tar yield 22.2 to 5.8 per cent. Gas analyses are given.

33.38. Charcoal Manufacture. Use of Wood and Charcoal in Producer-Gas Generators

33.38.1. REITZER, M., and STUX, S. **Fuel briquets.** *Hungarian Patent* No. 127,474, July 15, 1941. *Chem. Abs.* 35 (8261). P.R.

Finely powdered or sifted charcoal dust is mixed with 4 per cent. carbohydrate-containing material of vegetable origin that contains no proteins. The mixture is pressed to shape under 300 atmospheres and heated to 300° in the absence of air.

33.38.1. KOVÁTS, L. **Binding material for briquets of coal or charcoal.** *Hungarian Patent* No. 127,441, July 15, 1941. *Chem. Abs.* 35 (8261). P.R.

Powdered seeds of protein-rich leguminous plants (such as soya beans or lupins) are moistened in a slightly alkaline solution. The solution containing the binder is then evaporated to the desired thickness.

33.38.1. MOORE, D. **Washing and drying of charcoal.** *Experiment No. 2. Increase in moisture content during washing.* Queensland Sub-department of Forestry, 1940. pp. 3.

In the tests described cold charcoal gained 9 to 20 per cent. in moisture content after immersion in water for 30 seconds to 10 minutes. Increase in moisture content was slow in relation to time of immersion for periods that would be common in practice. It would therefore appear that a lag of several minutes in removing the material from the trough will not greatly affect the increase in moisture content. Immersion for 1 hour raises moisture only a few per cent. more than immersion for several minutes. The immersion of hot charcoal resulted in a big increase in its moisture content after only a few minutes.

33.38.1. **Washing and drying of charcoal.** *Aust. Timb. J.* 7, 1941–42 (518).

Chiefly a description of the method of washing charcoal as employed by the Producer Fuel and Wood Company, Brisbane. The washing apparatus consists of a wire cage, with a mesh not exceeding $\frac{1}{4}$ in., in the shape of a cube with sides of about 2 ft. 6 in. The cage is open at the top; the bottom is hinged on one side and is closed by means of a piece of wire or rope attached to the other side. The cage is suspended from the end of a pole which is used as a lever. The cage is submerged in a water hole to about half its height and a bag of crushed and graded charcoal is emptied into it. The bottom of the cage is opened and the floating charcoal agitated by means of a rake. The dirt sinks and escapes through the bottom of the cage, while the charcoal remains on the surface. After a minute or two the bottom of the cage is closed by means of the rope or wire and the cage raised out of the water and brought to the bank by means of the lever. The bottom of the cage is then opened and the charcoal spread on a tray made of several corn sacks stretched between two small poles. The charcoal is air-dried for at least 8 hours, after which it is bagged.

33.38.1. **Containers for charcoal.** *State Electricity Commission of Victoria.* p. 1.

Description of paper bags of 1.75 cu. ft. capacity costing approximately 4d. each, which, from preliminary trials, appear to be suitable charcoal containers.

33.38.1 : 07.7. KIRCHHOFF, L., and VOGT, A. E. **A portable kiln for charring of wood, peat and similar materials.** *German Patent* No. 699,766, Nov. 7, 1940 (Cl. 10a. 39). *Chem. Abs.* 35 (7159). P.R.

The kiln is made of concentric segments. Through the bottom segment, beneath the charge, enter pipes through which air is fed; these pipes radiate towards the centre and can be moved in and out.

33.38.1 : 07.7. LÜTHJE, H., and STEINERT, J. **Drying peat or wood.** *British Patent* No. 525,925, Sept. 6, 1940. *Chem. Abs.* 35 (7158). P.R.

Superheated steam is circulated between superheater and material. By raising the steam temperature up to 180° without pressure increase, the peat or wood is converted by decomposition of O-containing constituents into a coal product of higher heating value than the dry peat or wood substance.

33.38.1 : 07.7. WHITFIELD, C. **Charcoal kilns.** *British Patent* No. 526,416, Sept. 18, 1940. *Chem. Abs.* 35 (7158). P.R.

Details of apparatus.

33.38.1 : 07.7. DUNKER, L. H. A. **Wood charcoal.** *British Patent No. 526,135*, Sept. 11, 1940. Chem. Abs. 35 (7158). P.R.

A fresh air supply is introduced to the top layer of the charcoal already formed in the kilns and by so doing the CO will burn and produce further heat, which in turn will reduce the volatile contents of the charcoal. The kiln has means for admitting the air at different points and for exhausting the products of combustion.

33.38.1 : 07.7 : 33.38.2. ADRIAN, E. **Verfahren zum Verkohlen von Holz in einem Meilerofen.** [Process for carbonizing wood in a 'Meiler' kiln.] *Dtsch. Holzwirtschaft*. 58 (147), 1941. *Abstr. in Holz* 4, 1941 (368). [G.] P.R.

An account of *German Patent No. 706,227*, which describes a kiln system in which a gas suitable for motors is produced in addition to the usual products of carbonization. The non-condensable gases are led through the glowing charge and then through a gas cleaner and water cooler. The plant envisaged is a large one that would utilize the wood waste from a considerable area.

33.38.1 : 33.38.2. **The manufacture of charcoal for producer gas vehicles.** *Bull. Qd. Govt. Producer Gas Comm.* No. 3, 1940. pp. 8.

33.38.1 : 33.38.2. **Charcoal for mobile gas producers.** *Pamphl. N.S.W. For. Comm. Div. Wood Tech.* No. 5, 2nd ed. 1941. pp. 24.

A revised edition of the pamphlet recorded in *For. Abs.* 2 (153).

33.38.1 : 33.38.2. JOHNSTON, A. K. **Report on the effects of grading or sizing of charcoal on gas producer performance.** Division of Wood Technology, Forestry Commission of New South Wales. [1941?]. pp. 3.

In tests with the 'Official' (cross-draught) producer the Forestry Commission of New South Wales obtained the best results using charcoal of $\frac{1}{4}$ - to 1-in. grading. The inclusion of pieces down to $\frac{1}{8}$ in. in size gave greater bulk density to the fuel and thus a greater generator range, and reduced the time required for starting.

33.38.1 : 33.38.2. MOORE, D. **The ash content of charcoal for use in producer gas vehicles.** *Report No. 1.* *Project No. Q.U.18-2-1E.* Investigations Section, Queensland Sub-department of Forestry. 1940. pp. 6 + 4.

An account is given of the occurrence of mineral ash in charcoal and its effect in the producer-gas generator. It is pointed out that, in charcoal specifications, designation of the species to be used for charcoal burning would be more useful in preventing the formation of troublesome clinker and the accumulation of unclinkered ash in the generator than the present method of specifying the maximum ash content of the charcoal. A table is included showing for a number of Queensland timber species the ash content of the charcoal and the tendency of the ash to clinker in an up-draught generator working with steam injection.

33.38.1 : 33.38.2 (946). JAEGER, J. C. **The ash content of charcoal from some Tasmanian timbers.** *Aust. J. Sci.* 4, 1941 (45-7). [University of Tasmania.] L.S.

Ash determinations were made on charcoals produced from Tasmanian timbers by retort carbonization with a fairly slow pre-heating and a final temperature of 350° C. In most of the species examined the ash content was high in the charcoal from the outer layers

of the wood and fell fairly sharply to a constant value in that from the interior layers. The ash content was mostly rather higher for green than for dry wood, but for wood from the interior of the tree the difference was small. In some timbers the ash content was constant over most or all of the cross-section, or occasionally rather lower in the outer layers. Size of the timber had very little effect upon the average ash content. No large variation was noted in the ash content of heartwood of the same species from different localities. In the 26 species examined the average ash contents ranged from 0.2 per cent. (*Eucalyptus* spp.) to 2.1 per cent. (*Bedfordia salicina*), i.e. well below the 3 per cent. allowed by the standard specification. Comparison of the ash contents obtained for some of the species with those of the same species as manufactured commercially by kiln burning suggests that the values for charcoals made by the latter method can be expected to exceed those for retort-burnt charcoals by some 50-100 per cent. The ash content of bark was found to be much higher than that of wood, normally ranging from 5 to 20 per cent. and varying considerably from tree to tree. Unsound wood did not appear to have an ash content materially greater than that of sound wood.

33.38.1 : 33.38.2. BRIGDEN, A. C. **Report No. 1-41 on the investigation of the tar-producing properties of New South Wales charcoals.** New South Wales State Fuel Research Committee. 1941. pp. 2 + 1 + tbl., diagr., & gphs.

As a result of tests on 63 producer charcoals, it is stated that the volatile content should not exceed 15 per cent. of the oven-dry weight of the charcoal, unless its potential tar value has been found not to exceed 10 ounces per ton.

33.38.1 : 33.38.2 (94). **Australian Standard Specification (Emergency Series) for Wood Charcoal for Use in Gas Producers for Vehicles and Tractors.** *Emergency Standard No. (E)D.3002-1941.* Standards Association of Australia, Sydney. 1941. pp. 8.

33.38.1 : 33.38.2 (44). BERTHELOT, C. **La fabrication d'agglomérés mixtes de houille et de charbon de bois, à Vernon (Eure).** [The manufacture of mixed briquettes from coal and wood charcoal at Vernon (Eure).] *Gén. civ.* 117, 1941 (165-9). [F.] *Abstr. in Feuerungstechnik* 29, 12, 1941 (286). [G.] L.S.

Available charcoal supplies in France are barely sufficient to provide one-tenth of the utility vehicles with producer fuel. Efforts to produce charcoal briquettes have mostly failed by reason of the high consumption of wood tar, which is better utilized for other purposes. Mixed briquettes sold under the name of 'Actigaz' are now being manufactured; these consist of 70 per cent. of charcoal (later to be reduced to 50 per cent.) and 30 per cent. of high-volatile coal. These constituents are ground separately, mixed, supplied with a binder (3 per cent. wood tar with some cider-apple residue or seaweed extract), kneaded with 15-18 per cent. of water, briquetted at 150-200 atm. pressure, and then dried and desulphurized (up to 600° C.). The final briquettes contain at most 4 per cent. moisture, 7 per cent. ash (average 5 per cent.), 0.5 per cent. sulphur (average 0.3 per cent.), and 1 per cent. dust. They are well suited for use in producer-gas vehicles.

33.38.1 : 33.38.2 : 33.37. DERINGER, H. Eignung der Holzkohle aus verschiedenen Holzarten zum Automobilbetrieb. [Suitability of charcoals from various species of wood for producer-gas vehicles.] *Monatsbull. Schweiz. Ver. Gas- u. Wasserfachm.* 21, 1941 (187-9). [G.] P.O.

Road tests have shown that charcoals produced at the Horgen gasworks from Oak, Birch, and Lime wood—in spite of their considerably lower volatile content—were equal if not superior to good Slovakian Beech charcoal for use in producer-gas vehicles and the consumption was appreciably lower. Spruce charcoal from the same gasworks was markedly inferior to that from the hardwoods, the time for climbing being about 130 per cent. of that with hardwood charcoal and the total trip time about 20 per cent. longer. [Cf. abstract under 33.37 above.]

33.38.1 : 33.38.2 : 33.37 : 33.06 : 33.36.3 : 33.19. BELLU, T. Les progrès réalisables dans la préparation du bois destiné à la production du gaz des forêts. [Practicable improvements in the preparation of wood for gas producers.] *Gén. civ.* 117, 1941 (160). [F.] *Abstr. in Holz* 4, 1941 (368). [G.] P.R.

On the basis of experiments conducted at the 'Station d'Essais de Machines agricoles' it is proposed that producer wood should be brought to central establishments where it would be converted by chipping machines, air dried in wire-netting containers for 10 weeks, when the moisture content should have fallen to 27 per cent., oven-dried at 300° C. in a rotatory oven and carbonized immediately after drying. Volatile by-products would be recovered and the tar could be used as a binder for briquettes made of charcoal dust. Carbonization of the dried wood in the rotatory oven can be effected within 5-6 hours, whereas 24 to 48 hours are necessary with the usual stationary ovens.

33.38.2. Flugzeug mit Holz angetrieben. [Aeroplane driven with wood-gas.] *Holz* 4, 1941 (110). [G.] P.R.

An Italian Breda-15 with 85 h.p. motor and 1,400 r.p.m. was fitted with a wood-gas producer. A trial at the Taliedo aerodrome near Milan showed that the plane satisfied all set requirements.

33.38.2 : 07.7. KISSIN, I. Gas producers for motor vehicles and their operation with forest fuels. *Tech. Commun. Imp. For. Bur.* No. 1, 1942. pp. 37.

33.38.2 : 07.7. CASH, J. D., and CASH, M. G. Producer gas for motor vehicles. Angus & Robertson, Ltd., Sydney & London. 1940. pp. 168.

The book is intended chiefly for the guidance of operators of charcoal-fueled producers in Australia. Subjects dealt with include the theory of producer gas, producer fuels, the components of producer-gas plants, the fitting of producers to vehicles, means of overcoming the loss of power, the driving and maintenance of producer-gas vehicles, and the operating costs with producer gas. A number of French, British, and Australian plants are described, together with a simple plant design recommended for home-workshop manufacture.

33.38.2 : 07.7. REED, B. Producer gas for road transport. The Railway Gazette, 33, Tothill Street, Westminster, London, S.W.1. 1941. pp. 72.

Mainly a discussion of the use of producers with mineral fuels for passenger transport by road under British conditions. The booklet is divided into two sections: (1) an account of the taxation and Road

Traffic Act regulations, together with descriptions of the plants available, the progress made, and the results obtained, and (2) an account of the experiences of operators.

33.38.2 : 07.7. BURSTALL, A. F. The case for the use of producer gas vehicles at the present time. Department of Information, Melbourne. [1940?] pp. 12. [University of Melbourne.]

33.38.2 : 07.7. Government Emergency Type Gas Producer: notes on its operation and maintenance. H.M. Stationery Office, London. 1940. pp. 6 + diagr.

33.38.2 : 07.7 (410). Report of the Committee on the Emergency Conversion of Motor Vehicles to Producer Gas. H.M. Stationery Office, London. 1940. pp. 27.

33.38.2 : 07.7 (94). Australian Standard Specification (Emergency Series) for Charcoal Gas Producers for Motor Vehicles. *Emergency Standard* No. (E)D.3001-1941. Code No. (E)CD.1-1941. Standards Association of Australia, Sydney. 1941. pp. 23.

33.38.2 : 33.06 : 33.36.3. SCHENKER. Séchage artificiel du bois carburant à l'usine à gaz de Neuchâtel. [Artificial drying of producer fuelwood at the Neuchâtel gasworks.] *Monatsbull. Schweiz. Ver. Gas- u. Wasserfachm.* 21, 1941 (135-6). [F.] P.O.

At the Neuchâtel gasworks various facilities existed, such as heat-recovery boilers, coke extinguishers, etc., which have recently been turned to account for the drying of producer fuelwood. The plant is estimated to be capable of producing some 750 metric tons of dry fuelwood per annum or the equivalent of 250 tons of liquid fuel. The gasworks has become an official filling station for producer-gas vehicles.

33.38.2 : 33.06 : 31.24 : 31.22.1. CAZALIS, L. Le bois torréfié. [Roasted wood.] *Vie automobile* 37, 1941 (319). [F.] *Abstr. in Oel u. Kohle* 37, 45, 1941 (Sch. 261). [G.] L.S.

The fuel value of various types of wood and charcoal is illustrated by the following table:—

Fuel	Calorific value per 1,000 g. of fuel	Quantity of fuel from 1,000 g. of wood of 45 per cent. moisture content
Wood (45 per cent. moisture)	2,100 cal.	1,000 g.
" (25 " " " ")	3,100 "	740 g.
" (15 " " " ")	3,600 "	650 g.
" (dried at 100° C.)	4,400 "	550 g.
" (roasted at 290° C.)	5,300 "	450 g.
Charcoal (retort-burnt)	8,000 "	220 g.
" (pile-burnt)	8,000 "	160 g.

A detailed account is given of the advantages of roasted wood over wet and dried wood as a fuel for producer-gas vehicles.

33.38.2 : 33.06 : 33.36.3. CAZALIS, L. Roasted wood. *Vie automobile* 37, 1941 (326) : *Oel u. Kohle* 38, 1942 (Sch. 6). Fuel Res. Summ. 1942 (135). P.R.

Methods of drying and roasting wood are compared as regards the yield and composition of the gas obtained. The importance of maintaining optimum temperature in the producer is emphasized. A vehicle fitted with a

'Facel' roasting furnace is described. This furnace is specially designed to roast large quantities of wood for producers. [Cf. preceding abstract.]

33.38.2 : 33.38.1. **Producer gas and charcoal.** *Bull. Qd. Govt. Producer Gas Comm.* No. 2, 1940. pp. 16.

Included are cost schedules for 1½- to 2-ton lorries, medium and heavy cars and light utility vehicles, and tractors, respectively, which give some indication of the extent of the savings to the user that result from operating a vehicle on charcoal instead of liquid fuel.

33.38.2 : 34.6. LIST, H. Generatorbetrieb mit Holzsäb-fällen. [Producer operation with wood waste.] *Oel u. Kohle* 37, 1941 (811-4). [G.] L.S.

In Greater Germany some 3 million cu. m. of shavings, 6 million cu. m. of sawdust, and 10 million cu. m. of coarse wood waste could be made available annually for use in gas producers. 7.5 solid cu. m. of wood could replace 1 metric ton of petrol in the motor. Calorific values in k.cal./Nm³ obtained with the transport producer 'G' were:—Beech 1,180, softwood 1,120, hardwood twigs 1,100, softwood twigs 1,020, Oak bark 1,070, railway sleepers 960; corresponding values obtained with 'Producer Oil' were:—Beech 1,230, softwood 1,110, hardwood twigs 1,100, softwood twigs 1,010, softwood bark 1,030, Larch 1,030, Oak bark 1,060, railway sleepers 890. Investigations at the Graz Technical College showed that the reactivity of different varieties of charcoal is closely correlated with the calorific value in the producer of the wood from which the charcoal is made. In designing producers, low reactivity should be balanced by longer reaction period and higher temperature in the reaction chamber.

33.39. Manufacture of Sugar, Oils, Alcohol, and Vinegar from Wood

33.39. BE[R]THELOT, C. Hydrolysis of wood cellulose, aliphatic fermentation of wood sugar and production of alcohol and ketones for fuel. *Gén. civ.* 118, 1941 (69-75); *Chem. Zbl.* 113, I, 1942 (549). *Fuel Res. Summ.* 1942 (164). P.R.

33.39 : 31.3. BERTRAND, G., and BROOKS, G. Methanol content of wood and lignified tissues. *Compt. rend.* 210, 1940 (773-6); *Chem. Zentr.* 1941, I, 1367. *Chem. Abs.* 35 (8257). P.R.

33.39 : 33.32 : 34.6. MCCARTHY, J. L. Recent developments in the production of ethanol from waste sulphite liquor and wood. *Pulp Paper Mag. Can.* 43, 1942 (205-6, 208, 210, 212, 214). [University of Washington, Seattle.]

33.4. Converted Structural Timber

33.4 : 12.26-8. Ölimprägnierte Buchenparkettstäbe als Fussbodenbelag. [Oil-impregnated Beech parquet blocks as flooring.] *Baugilde* 22, 1940 (359). [G.] *Abstr. in Holz* 4, 1941 (45). [G.] P.R.

33.5. Pitprops, Sleepers, Poles and Other Roughly Converted Wood

33.51 : 31.27. JOYCE, A. R. Steel and timber roof supports for mine timbers. *Wood Pres. News* 19, 1941 (110-7). *Repr. from Mining Congress Journal*, August 1941. P.R.

A report of the Coal Division of the American Mining Congress, containing observations on permissible loads for mining timbers and steel supports. Tables are included to show (i) sizes of knots permitted in round

timbers for 'per cent. grades'; (ii) sizes of wood and steel beams required to support various loads at different spans; (iii) permissible loads for treated round timber columns; (iv) column loads determined from allowable bearing stress on Oak cap; and (v) allowable loads on steel sections used as columns.

33.51 : 38. RAPRAEGER, E. F. **Timber and metals.** *Timberman* 43 (4), 1941-42 (19-21, 51-6). [Potlatch Forests Inc., Lewiston, Idaho.]

An account of the methods used in timbering the metal mines of Montana where the tree species most generally used for mine timbers are Douglas Fir and Larch. The annual consumption of round mining timbers averaged 12 million bd. ft. during the period 1925-37.

33.6. Packing Boxes, Crates, etc.

33.6 : 31.0 (54). LIMAYE, V. D. **The testing of Indian woods for ammunition boxes. Parts I-III. Leaflet.** (Utilization) *For. Res. Inst., Dehra Dun* No. 2, 1941, pp. 5; No. 3, 1941, pp. 3; No. 4, 1941, pp. 3. P.R.

33.6 : 31.0 (73). CARLSON, T. A. **Boxmakers play vital war role.** *Sth. Lumberm.* 164 (2061), 1942 (42-5). [Forest Products Laboratory, Madison, Wis.]

In the United States box woods have, for some time past, been classified into four groups, each group having its particular use and the woods in each group having similar properties and being interchangeable in use. Characteristic properties of each group are noted and the representative species are listed. The importance of proper nailing in box construction is emphasized and nailing schedules are tabulated for the different wood groups and sizes of material.

33.7. Firewood

33.7. AAMOT, O. C. **Wood fuel from the chemical and metallurgical point of view.** *Tids. Kjemt Bergvesen* 20, 1940 (138-40). *Chem. Abs.* 35 (8257-8). P.R.

Wood fuel treated with fire-retarding chemicals to decrease the rate of combustion is recommended as a substitute for coal in the present crisis. Of 20 chemicals studied, NH₄Br gave the best results as a retarding agent.

33.7 : 07.7. LEMPELIUS. **Firing of wood waste containing 74 per cent. of water in a shell boiler with step-grate underfiring.** *Wärme* 64, 1941 (315). *Fuel Res. Summ.* 1942 (65). P.R.

Test data are tabulated.

33.8. Other Manufactured Products

33.8. BOURQUIN, A. **Canalisations de bois.** [Wooden conduits.] *J. for. suisse* 93, 1942 (65-7). [F.]

In the Bouillet salt mines near Bex, wooden conduits through which salt water has been brought to the surface were found to be in perfect condition when replaced after approximately 120 years' service. The salt had impregnated the wood and acted as a preservative.

33.8 : 31.0 : 12.25 : 12.26-8. UNION OF SOUTH AFRICA. **Department of Agriculture and Forestry, Division of Forestry. Annual report for the year ended 31st March, 1941.** Govt. Printer, Pretoria. 1941. pp. 18.

Tests have shown Common Yellowwood (*Podocarpus elongata*) and Clan-William Cedar (*Widdringtonia juniperoides*) to be suitable for battery separators, and Cape Ebony (*Heywoodia lucens*) for slide rules (p. 15).

33.8 : 31.0 : 12.26-8. BOMBAY. Forest administration report of the Province of Bombay for the year 1940-41. Part I pp. 59; Part II pp. 79. Supt., Govt. Printing & Stationery, Bombay. 1942.

Picking-stick arms of unseasoned *Grewia tiliaefolia* tested in a jute mill in Calcutta compared favourably with sticks of English Ash (p. 30).

33.8 : 33.91. LIMAYE, V. D. Specification for the inspection and passing of helves and hammer handles. *Indian For. Bull. (n.s.) Utilisation* No. 94, 1941. pp. 7. [Forest Research Institute, Dehra Dun.]

This bulletin is issued for the guidance of the Indian tool-handle industry.

33.8 : 31.0 : 31.27 : 33.36.3 : 33.91. LIMAYE, V. D. Properties, preparation and testing of helve and tool handle timbers. *Indian For. Bull. (n.s.) Utilisation* No. 99, 1941. pp. 13. [Forest Research Institute, Dehra Dun.]

The bulletin discusses characteristics, seasoning, and testing and strength of tool-handle timbers, and selection of handle blanks, and includes a table giving the relevant strength data on Indian timbers tested at the Forest Research Institute, Dehra Dun.

33.8 : 33.15. Self-ventilating black-out screen of plywood. *Aust. Timb. J.* 7, 1941-42 (562, 566).

Details of the 'Plyventa' screen, the design of which has been placed at the disposal of the public through the Timber Development Association of Australia.

33.9. Grading and Storage of Converted Timber

33.91 (43.1-5). Requirements respecting the quality of structural timber. DIN 4074. *Bauverwaltung* 60 (6), 1940 (99-100). Building Sci. Abs. (n.s.) 14 (791). P.R.

Text of the German specification for the quality of structural timber.

33.91 : 98.3 : 12.25 (73). Official grading rules for Hemlock and Tamarack lumber conforming to American Lumber Standards, and White Cedar shingles; effective June 27, 1941. Northern Hemlock and Hardwood Manufacturers Association, Oshkosh, Wis. 1941. pp. 78.

33.92 : 31.8. MOTTET, A. L. Checking and splitting losses of lumber in green storage. *W. Cst. Lumberm.* 69 (1), 1942 (54, 58). [W. Cst. Lumbermen's Association.]

Losses due to splitting and checking occur in green lumber between sawing and placing in the kiln, particularly during the severe air-drying season. Preventive treatments include (a) the occasional use of a water spray on warm, dry days to prevent checking, (b) the application of a moisture-retarding end coating and the even piling of the lumber to prevent end checking and splitting, and (c) the use of shed storage.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. Vegetable Products

34.24. Tanning Materials. Cork

34.24. GRASSMANN, W., and KUNTARA, W. Beiträge zur Kenntnis einheimischer Pflanzenstoffe. I. Mitt.: Die Extraktion von Gerbrinden mittels organischer Lösungsmittel. [Contributions to the knowledge of German plant materials. I: The extraction of tanbarks with organic solvents.] *Collegium* No. 852 (4), 1941 (98-104). *Abstr. in Holz* 4, 1941 (368). [G.] P.R.

Extractions of the bark of various German tree species first with organic solvents and then with water showed that the yield of tannins so obtained was often considerably higher than in simple water extractions. The barks contained tannins soluble in both water and organic solvents such as alcohol or acetone, tannins soluble only in the latter but becoming water-soluble after a sulphite treatment (Sulfitierung), and tannins soluble only in water. The extra yield obtainable with organic solvents consists mainly of phlobaphenes.

34.24 (59.6-9) : 34.26. CREVOST, C., and PÉTELOT, A. Catalogue des produits de l'Indochine. VI. Tannins et tinctoriaux. [Catalogue of the products of Indo-China. VI. Tannins and dyestuffs.] *Bull. écon. Indochine* 44, 1941 (371-426). [F.] Pl. Sci. Lit. 14 (26), (5).

34.24 : 12.25 : 12.14.8. FREY, R. W., and CLARKE, I. D. Tannin content of Sitka Spruce bark. *J. Amer. Leather Chemists Ass.* 36, 1941 (576-84). [Eastern Regional Research Lab., Bureau of Agricultural Chemistry & Engineering.] L.S.

The average tannin content of 31 samples of Sitka Spruce bark from Washington and Oregon was 24.1 per cent., the individual results varying from 11.2 to 37.2 per cent. Tannin content was related both to position in tree and age of tree, increasing with height from the ground and, at least for bark near the butt end, decreasing with age of tree. Excluding 8 samples from the base of old trees, the average for the remainder was 26.8 per cent., or about 11 per cent. more than that for Western Hemlock bark. Qualitative tests showed that the tannin is of the catechol type. Total sugars in the bark ranged from 3.3 to 12.4 per cent., increasing with height from the ground and decreasing slightly with age of tree. In spite of the high tannin content and probably satisfactory tanning properties, Sitka Spruce bark is very thin and would give a low yield per tree, and it seems that a large volume of tanning extract could not be produced from this source alone; in favourable places, however, the production of extract from Western Hemlock might possibly be supplemented by the use of Sitka Spruce bark.

34.24 : 12.26-8. OSIMA, Y., ISII, M., and HYO, Z. Studies on the vegetable tannins in Taiwan. Part 5. Manufacture of tanning extract from the bark of *Acacia confusa*. I. *J. agric. chem. Soc. Japan* 16, 1940 (71; 288-92). [Jap.e.] L.S.

The maximum yield of tannin was obtained by extracting the dried bark with 50-per-cent. alcohol; water extraction of fresh bark gave an equally good yield but the process was far easier and faster with 50-per-cent. alcohol. The maximum extraction temperatures were 80° C. for dried bark extracted with water, 60-80° for dried bark extracted with alcohol, and 80° for fresh bark extracted with alcohol.

34.24 : 12.26-8. CHOUDARY, K. S. *Terminalia arjuna* as a tanning material. *J. Intern. Soc. Leather Trades' Chem.* 25, 1941 (56-8). Chem. Abs. 35 (8346). P.R.

A sample of the bark contained tannin 15.8, soluble non-tannin 8.2, and H₂O 7.5 per cent. Both hydrolysable and condensed tannins were present. The fruit contained about 8.2 per cent. tannin (H₂O 10.8 per cent.). The bark is easily leached, the resulting solution (analytical strength) has a pH of 4.7, ferments more slowly, and penetrates more rapidly than solutions of

other south Indian tanning materials. Leather tanned with *T. arjuna*, alone or mixed with myrobalans, was very firm but of inferior colour.

34.24 : 12.26-8 : 07.7. **Barking of Oak: a few notes on what to do and how to do it.** *Timb. Tr. J.* 161 (3423), 1942 (4).

A brief account of the usual English technique.

34.25. Medicinal Plants

34.25 : 12.26-8. PHILLIPS, A. D. **Corkwood, a source of an essential drug.** *Qd. agric. J.* 56, 1941 (416-8). L.S.

Corkwood (*Duboisia myoporoides*) is among the richest known sources of the alkaloid hyoscyne, a powerful sedative used in the treatment of certain mental disorders. Owing to the war, which has not only cut off the normal sources of this drug but also greatly increased the demand for it, hyoscyne is now being extracted from Corkwood leaves, of which more regular supplies are desired. The species is a shrub-like tree 10-15 ft. high and is found throughout the coastal belt of Queensland and New South Wales. Care is needed in handling the leaves, as hyoscyne is a strong poison. It is pointed out that *Duboisia hopwoodii* and *Erythrina vespertilio*, which is also known as Corkwood, are useless as sources of hyoscyne.

34.26. Resin. Turpentine. Oils. Gums.

Rubber. Gutta Percha

34.26 (43.8). LOYCKE, H. J., **Harzerzeugung in Polen. Ein Rückblick. [Resin production in Poland. A retrospect.]** *Forstarchiv* 16, 1940 (205-12). [G.] R.M.I.

A review of methods and statistics of resin production in Poland.

34.26 (91 : 92). KOOPMAN, M. J. F. **Damar and copal in the Netherlands Indies.** *Proc. 6th Pacif. Sci. Congr., Pacif. Sci. Ass., 1939*, 4, 1940 (739-43). C.G.B.

A conference paper containing a brief review of research in the Dutch East Indies on damar (Dipterocarp resins) and copal (*Agathis* resins).

34.26 : 12.25 : 12.11.15. TOLKACHEV, A. K. **The content of resin in the resin fraction, in relation to the diameter of the cut tree.** *Mitt. Kirov. forsttech. Akad.* 1940 (58), (93-127). Chem. Abs. 35 (7218). P.R.

The resin content of tree stumps increases considerably with increase in their diameter, the resin fractions of 20-cm. and 40-cm. stumps containing 9.95 and 28.68 per cent. of resin, respectively. More resin is formed in trees when their annual growth is greater. The resin content also increases with the diameter of the core and the width of the annual rings. Most resin occurs in the collar, least in the roots. The higher resin content in stumps of larger diameter is attributed to (i) the flow of resin from the existing system of resin ducts into the formed layer of heartwood, and (ii) the transformation of the fatty acids into resin and the formation of resin in the parenchyma of the heartwood rays. The enrichment of the stump resin fraction by the transfer of resin by water or by the transformation of cellulose into resin was not confirmed.

34.26 : 12.25 : 12.11.15. SANDERMANN, W. **Studien über Harze. V. Mitteilung. Wichtige physikalisch-chemische Vorgänge beim Harzfluss der Nadeln. [Studies on resins. V. Important physico-chemical processes in resin flow in the conifers.]** *Ber. dtsh. chem. Ges.* 74, 1941 (1696). *Abstr. in Auszüge aus der*

Literatur, suppl. to Cellulosechemie 19 (6), 1941 (116). [G.] P.R.

It is now established that the crystallization and consequent hardening and whitening of coniferous balsam exudations upon exposure to air is due to increases in their water content. Carefully dehydrated resin remained in a thinly fluid state after a year, whereas the addition of 0.1 per cent. of water initiated crystallization within 8 hours, and with 2 per cent. of water crystallization was rapid and extensive. Glycol, glycerine, and lactic acid have an effect similar to that of water.

34.26 : 12.25 (54). GUHA, P. C., and ROY, A. N. **Utilisation of Indian turpentine oils. I. Constituents of turpentine oil from *Pinus longifolia*, Roxb., *P. excelsa*, *P. khasya*, and *P. merkussi*. II. Conversion of α - and β -pinenes into bornyl acetate by acetic acid in presence of catalysts. III. (1) Catalytic isomerisation of α -pinene and β -pinene to camphene. (2) Synthesis of camphor from pinene-camphene mixture.** *J. Indian Inst. Sci.* 23, A, (201-7; 208-16; 217-25). B.C.P.A. 1942, A. II (59-60). P.R.

34.26 : 12.25 : 34.27. KAUFMANN, H. P., and LIU, F.-Y. **Analysis of a Pine-seed oil.** *Fette u. Seifen* 47, 1940 (409). Chem. Abs. 35 (8332). P.R.

34.26 : 12.25 : 34.6. MAYFIELD, P. **The utilization of Pine stumps in defense.** *Paint, Oil and Chemical Review* 103 (8), 1941 (9-11). [Hercules Powder Co.] P.O.

A conference paper, reviewing in popular style the resin products manufactured by the Hercules Powder Co. from stump wood of Southern Pine.

34.26 (943). **Essential oils . . . a neglected forest industry.** *Aust. Timb. J.* 7, 1941-42 (557, 579).

Note on the production of essential oils from Queensland forest trees and shrubs. The cultivation in plantation form of *Backhousia citriodora*, which is now comparatively scarce in nature, is specially advocated. One ton of leaves of this species yields approximately three gallons of lemon oil.

34.26 : 12.26-8. BERRY, P. A., and SWANSON, T. B. **An examination of the essential oils distilled from the tips and normal cut of *Eucalyptus polybractea*.** *J. Proc. R. Soc. N.S.W.* 75, 1941 (65-70). Chem. Abs. 36 (614-5). P.R.

34.26 : 12.26-8 (89). GONZÁLEZ, M., LOMBARDO, A., and MESA DE ROMERO, M.A. **Contribución al estudio de la esencia de *Eucalyptus globulus*. [Contribution to the study of the essential oil of *Eucalyptus globulus*.]** *Rev. Farm., B. Aires* 83, 1941 (301-3). [Span.] Biol. Abs. 16 (5397).

A list is given of 75 species of *Eucalyptus* cultivated in Uruguay. Data are provided on the constants and composition of the volatile oil from *E. globulus*, which is the commonest species.

34.26 : 12.26-8. ROVESTI, G. **Laurel (*Laurus nobilis* L.) and its utilization.** *Riv. ital. essenze profumi, piante offic., olii vegetali, saponi* 23, 1941 (220-49). Chem. Abs. 35 (8332). P.R.

Chemical data are given for the composition of the leaf oil, fruit oil, and cakes obtained from *L. nobilis*.

34.26 : 12.26-8. ***Leptospermum citratum* oil from Kenya.** *Bull. imp. Inst., Lond.* 40, 1942 (1-5).

Notes on experiments with *L. citratum* as a plantation crop in Kenya. Yield and composition of the Kenya

oil compare well with those for Australian material, and buyers have shown interest in the product. Commercial development of this crop in Kenya would depend upon whether the oil could be produced at a price to compete with that of lemon-grass and Java citronella oils.

34.26 : 12.26-8. HULSSEN, C. J. VAN, and MEYER, T. M. Ethereal oils from *Melaleuca alternifolia* and *Melaleuca bracteata*. *Ing. Nederland.-Indië* 8, 18, VII, 1941 (84-7). *Chem. Abs.* 36 (623). P.R.

34.26 : 12.26-8 : 12.14.8. SOLNTEV, A. A. Über die Zusammensetzung des Öles aus der Rinde der Linde (*T. parvifolia*). [On the composition of the oil from the bark of Lime (*Tilia parvifolia*).] *C.R. Acad. Sci. U.R.S.S.* 30, 1941 (834-5). [G.] A.P.B.

Bark from young trees of *Tilia cordata* (*T. parvifolia*) was collected in February, dried to a moisture content of 5.7 per cent., and extracted with petroleum ether (fraction 45-65°). The yield, calculated against the dry bark, was 8 per cent. of an oil of specific gravity (20° C.) 0.956, refractive index (22° C.) 1.4808, acid number 9.6, saponification number 197, and iodine number 96.59. Treatment of the saponified material with petroleum ether gave 9.23 per cent. (based on the oil yield) of unsaponifiable matter, which was a crystalline, pale orange substance. The first recrystallization of this from alcohol gave rather large and regular crystals of melting point 133° C. Repeated recrystallization, finally from absolute alcohol, gave a fine crystalline product of melting point 182-183° C., from which an acetate was obtained of melting point 161-165° C. The Hager-Salkowsky and Liebermann reactions both indicated a high phytosterin content, and analysis of the phytosterin of melting point 182.5° C. gave a composition corresponding to $C_{28}H_{46}O$. This phytosterin appears to be hitherto undescribed. Decomposition of the soaps and separation of the fatty acids gave a product of specific gravity (20° C.) 0.949, refractive index (22° C.) 1.4723, neutralization number 208, and iodine number 96.8. Separation of the saturated and unsaturated acids by Twitchell's method yielded 4.8 per cent. saturated acids, 3.7 per cent. palmitic and 1.4 per cent. stearic acid, melting point of acid mixture 4.7° C. The unsaturated acids had the following properties:—iodine number 102, neutralization number 204, molecular weight 270, oleic acid about 52 per cent., α -linoleic acid 43 per cent. From its composition, the oil obtained from Lime bark would belong among the semi-drying oils. [Cf. *For. Abs.* 3 (136).]

34.26 : 12.26-8 : 34.27. CHILD, R., and NATHANIEL, W. R. N. The seed fat of *Garcinia echinocarpa* Thwaites—'Madol oil'. *Trop. Agriculturist* 97, 1941 (78-81). [Coconut Research Scheme, Ceylon.] L.S.

The kernels of *Garcinia echinocarpa* (Sinh. Madol) contain about 64 per cent. of a solid fat. The seed fat, in common with other seed fats of *Garcinia* spp. and the *Guttiferae* generally, contains notable proportions of stearic and oleic acids. It might be applicable in soap making and in the preparation of 'stearine'. As obtained from the seeds it is, however, acid, dark in colour and of pronounced odour, and would need extensive refining. Its commercial exploitation would therefore be doubtful unless the seed could be collected in quantity at a very cheap rate. *Authors' summary.*

34.26 : 12.26-8 : 34.27. FRAHM, E. D. G. The fat of *Pentadesma butyracea* Sab. *Ing. Nederland.-Indië* 8, VII, 1941 (87-8). *Chem. Abs.* 36 (671-2). P.R.

At 13 per cent. moisture the seeds contain 31.7 per cent. of fats and are a good source of technical stearic acid. Analytical data are given.

34.26 (7 : 213). DEMMON, E. L. Rubber production opportunities in the American tropics. *J. For.* 40, 1942 (207-10). [Southern Forest Exp. Sta.]

34.26 : 12.26-8. SAKAROVA-TIMOFEEVA, N. The cultivation of *Euonymus verrucosa* Scop. *Lesnoe Khozyaystvo, Moscow* 1940 (7), (45-50). [R.] *Abstr. in Forstarchiv* 17, 1941 (318). [G.]

34.27. Seeds. Fruits. Flosses

34.27 : 12.26-8. ZAND, S. J. Kapok, a survey of its history, cultivation and uses with special consideration of its application to thermal and acoustical treatments. The Author, New York. 1941. pp. 119. *Pl. Sci. Lit.* 15 (4), (12).

34.27 : 12.26-8 (66.9). WEST, J. On the future of Cacao in Oyo Province. *Farm & Forest* 2, 1941 (141-3).

With particular reference to the availability of suitable soils and to possible developments in the methods of cultivation. [Cf. *For. Abs.* 3 (332).]

34.27 : 31.0 : 12.26-8. VORREITER, L. Eigenschaften und Verwertung der wichtigsten Obstbaumhölzer. [Properties and uses of the most important fruit-tree woods.] *Dtsch. Holzwirtschaft.* 58 (86), 1941. *Abstr. in Holz* 4, 1941 (366). [G.] P.R.

Tables are given to show the volume of fruit-tree wood in Greater Germany and the physical and mechanical properties of the individual species, which include Apple, Apricot, Pear, Sweet and Sour Cherry, Peach, Plum, and Walnut. The total volume—based on 1932-33 figures for Germany and 1930 figures for Austria—is estimated at 5,649,300 solid cu. m. of stem timber and 11,074,100 solid cu. m. of cordwood. The woods are used chiefly for such special purposes as fine cabinet-making, turnery, inlaying, carving, etc.

34.27 : 33 : 12.26-8. Einschnitt von Obstbaumhölzern. Zur Verwertung von Obstbaumhölzern. Pflege und Verwendung von Obstbaumhölzern. [Cutting of fruit-tree woods. Utilization of fruit-tree woods. Care and use of fruit-tree woods.] *Dtsch. Holz-Anz.* Nos. 19, 24, and 25, 1941. *Abstr. in Holz* 4, 1941 (366). [G.] P.R.

With special reference to the initial conversion and seasoning of small billets for use in turnery and other special purposes.

34.28. Bamboos

34.28 : 12.29 : 23.24.1 : 23.26.3. DOLOGUIN, F. C. Bareroot transplanting of wild Rattan seedlings. *Philipp. J. For.* 4, 1941 (279-83). [Bureau of Forestry, Philippines.]

Tests with Biri (*Calamus siphonospatus* Mart.) and Sumulid (*Daemonorops ochrolepis* Becc.) gave satisfactory survivals. Higher survivals were obtained with seedlings less than 20 cm. long than with larger plants.

34.6. Utilization of Logging and Milling Waste

34.6 : 11.47.12. HASSEL, G. M. VON. Humus. *German Patent* No. 701,406, Dec. 12, 1940 (Cl. 16.14). *Chem. Abs.* 35 (7638) P.R.

Sawdust and other wood waste, which do not

decompose easily, are mixed with lime. The mixture is heated at elevated temperatures (150–260°). The hot mass is quenched with any waste water and kept so for several hours. It is then mixed with approximately 10 per cent. of peat. In this stage it can be used as fertilizer or soaked again with waste waters, inoculated with soil bacteria and allowed to decompose entirely.

34.6 : 12.25. **Hoop Pine sawdust for cleaning, drying and polishing metal work.** *Mon. News Lett. Div. For. Prod. Aust.* No. 119, 1941 (2).

Experiments indicate that pure, dry Hoop Pine sawdust can be used successfully for the drying and polishing of metal work. In the past large quantities of Douglas Fir and Hemlock sawdust have been used for this purpose.

34.6 : 12.25 : 12.14.8 : 33.32. **Wearing wood.** *Wood Products* 47 (3), 1942 (16–7).

In a new process developed by the Pacific Lumber Company, San Francisco, short fibres from Redwood bark are combined with wool fibres in textile mills. The blend is eventually spun into yarn which can be woven or knitted into fabrics having properties similar to pure wool textiles. The blended fibres can also be combined into felts for making felt hats. Combinations range from 15 to 60 per cent. of the bark fibre in the finished product, thus enabling a substantial saving in wool. Also, the cost of the final product is lower than with pure wool.

34.6 : 33.16. **Sawdust, wood flour, shavings, and excelsior.** A treatise, supplementing the Committee's bulletin 'Sawdust and wood flour'. 6th Edition. National Committee on Wood Utilization, Department of Commerce, Washington, D.C. As issued by the Timber Development Association, Ltd., 75, Cannon Street, London, E.C.4. 1941. pp. 13.

Information, with reference to the United States, is given on uses of sawdust, types and use of wood flour, use of shavings, manufacture and use of excelsior (wood wool), and on fuel briquettes using sawdust, shavings, etc.

34.6 : 33.38.2 : 31.45. BÖTTCHER. **Selbstentzündung von Holzmehl und Sägespänen.** [Spontaneous ignition of wood meal and sawdust.] *Feuerschutztechnik* 21 (3), 1941 (41). *Abstr. in Feuerungstechnik* 29, 1941 (236). [G.] L.S.

In view of a case of fire in a wood-gas producer plant, probably due to the formation of nests of moisture (rise of temperature possibly resulting from the activity of anaerobic micro-organisms), it is pointed out that bunkers for sawdust and wood meal should be of fire-proof construction and provided with a weatherproof roof and steam connexion, as water sprinklers are not sufficient. Temperature supervision is necessary and an open space of at least 5 m. should be left around the plant.

34.6 : 33.7 : 07.7. WEBBER, L. E. **Furnaces for wood burning.** *Power*, N.Y. 85, 1941 (471–3). [University of New Hampshire.] L.S.

The general nature of equipment for burning wood waste is determined largely by the moisture content of the latter. Suspension burning is practicable only when the moisture content is low and the fuel is uniform and of small particle size. The only practical method of burning wet wood waste is on a grate set in an extension furnace or Dutch oven. The burning of wet wood requires heat, first to drive off the moisture and

later for the distillation of volatile substances, and such heat is best supplied by radiation from hot surfaces near by. Complete combustion of the gases is important, as most woods have about 80 per cent. volatile matter (based on dry weight). Constructional and operational details of burners are discussed and sectional diagrams are given for some types of plant.

34.6 : 33.7 : 07.7. HARRIS, P. **Burning sawdust.** *Wood* 7, 1942 (70–2). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Description of a few simple types of burners.

34.6 : 33.7 : 12.14.8 : 34.24. BRANFORD, J. R. **Production of fuel from bark waste.** *British Patent* No. 542,769, 1942. *Fuel Res. Summ.* 1942 (177). P.R.

A method of producing fuel from the bark waste of tanning factories which consists in subjecting the waste to high pressure and in mixing with it a readily combustible component, e.g. coal dust or oil.

34.6 : 33.7 : 33.36.3. **On the drying of wood fuel in the form of sawdust and the like.** *Svensk PappTidn.* 44, 1941 (495–506). *Abstr. in Auszüge aus der Literatur—suppl. to Papierfabrikant* 40, 1942 (10). [G.] P.R.

The known methods of drying finely divided wood waste are enumerated, some fundamental questions and the possibilities of effecting savings are discussed, and results obtained with various types of driers are reviewed. Descriptions follow of drying plants produced by some Swedish manufacturers.

34.6 : 35. STRAUSS, C. W. **The need for better wood utilization.**—With discussion. *J. För.* 40, 1942 (144–9). [U.S. Forest Service.]

The most important problem in improving wood-utilization practices is to make known the practical results of research in wood conversion and use to the industries concerned, particularly to the large group of wood manufacturers, fabricators, converters and users who have no trade press facilities to keep them informed. Methods by which foresters may help in this problem are discussed on the basis of problem analysis, research, and the extension of good wood-utilization practices.

38. FOREST CONSTRUCTIONAL WORKS. ENGINEERING

38.2. FLETCHER, K. M. **The Lamella roof.** *Aust. Timb. J.* 7, 1941–42 (457, 459, 473, 475, 492).

The Lamella Roof Company of Sydney has now completed the development of the wooden Lamella Roof to comply with Australian requirements. The paper outlines the design of Lamella arches and their advantages. Initially developed by Zollinger in Germany, Lamella roofs are now used throughout Europe and the U.S.A. The Lamellas making up these roof structures are of standardized size and of narrow but high cross section. They average about 9 ft. in length and can be kiln-dried economically.

38.2. **New method of roof sheathing reduces labour and materials.** *B.C. Lumberm.* 26 (1), 1942 (50).

Sheathing boards 1 in. × 6 in. are spaced apart so that distance from lower edge to lower edge is double the shingle exposure. The method is illustrated by a chart and table.

38.2. JAY, B. A. **Timber's place in civil engineering.** *Repr. from Civ. Engng.* Dec. 1941. pp. 3.

Includes a brief description of timber connectors for transmitting joint stresses.

38.2. **Engineering in timber.** Timber Engineering Co., Washington, D.C. [1940?]. pp. 20. P.R.

Annotated photographs of actual timber structures built with timber connectors.

38.2. MYER, J. E. **Designing timber connector structures.** Timber Engineering Co., Washington, D.C. 1940. pp. 21. AIA File No. 19 B1. P.R.

38.2 (410). **Ministry of Works and Buildings recommendations for timber economy.** *Wood* 7, 1942 (30-5).

The Department of Constructional Design of the Ministry of Works and Buildings has prepared, chiefly for the use of government departments, notes and drawings showing how timber can be economized in the woodwork of buildings. The article summarizes the chief recommendations and gives a selected number of the designs recommended.

38.2 : 31.27 : 33.4 : 33.91. **Economy in timber: maximum safe spans for joists and rafters of graded timber.** *Leaflet For. Prod. Res. Lab.* No. 22, 1942. pp. 8. [Princes Risborough.] P.R.

Tables are given to show maximum safe span in relation to imposed load per sq. ft. and spacing of the joists, using timber graded in accordance with instructions in *Leaflet For. Prod. Res. Lab.* No. 19 [For. Abs. 3 (330)]. Minimum thicknesses of floor boards for various loads and joist spacings are also tabulated.

38.2 : 31.27 : 33.4 : 33.91 : 31.8. LANGLANDS, I., and THOMAS, A. J. **Handbook of structural timber design.** *Tech. Pap. Div. For. Prod. Aust.* No. 32, (2nd ed.) 1941. pp. 299. P.R.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

42.2. Temperature Influence

42.21 : 07.7. STUDHALTER, R. A., and GLOCK, W. S. **Apparatus for the production of artificial frost injury in living plant tissues.** *Abstr. in Amer. J. Bot.* 28 (10), 1941 (6s). [Texas Technological College, Lubbock.] O.B.D.

During studies of growth layers in trees an apparatus for producing frost injury was devised. It consists of a well insulated box in which a temperature as low as -30° C. can be maintained by means of solid CO₂ for 2 hours or more.

42.21 : 12.25. GLOCK, W. S., and STUDHALTER, R. A. **Frost injury artificially induced in Arizona Cypress.** *Abstr. in Amer. J. Bot.* 28 (10), 1941 (3s). [Texas Technological College, Lubbock.] O.B.D.

Artificially produced frost injury in branches of Arizona Cypress exactly duplicates injury caused by natural frost and may therefore be of use in controlled studies.

42.3. Precipitations

42.31 : 12.19.2 (76.6) : 12.19.4. FEATHERLY, H. I. **Silting and forest succession on Deep Fork in Southwestern Creek County, Oklahoma.** *Proc. Okla. Acad. Sci.* 21, 1941 (63-4). L.S.

Alluvial deposits formed on the flood plain of Deep Fork vary in depth from zero to 10 ft. and more. The original cover of Oak/Hickory forest, composed mainly of *Quercus macrocarpa*, *Q. borealis*, *Carya illinoensis*, *Ulmus americana*, *Populus deltoides*, and *Fraxinus lanceolata*, has been destroyed by lack of soil oxygen

38.2 : 33.15. **A plywood building.** *Wood* 7, 1942 (62-4, 67-9).

Details of the new wartime economy hostel designed by the Ministry of Works. The hostel is made entirely of wood, yet less wood material is used in its construction than in a pre-war hut of the same size classed as a 'non-timber' building. This has been achieved by attention to design so as to economize timber in every way and by the increased use of plywood. Walls, roof, doors, and furniture fittings are all of plywood on a light timber frame. They are made in sections in the factory and the parts are erected in a few hours on a cement base previously laid down. The plywood walls and roof sections are faced on the exposed side with resin-bonded ply.

38.3. TRYON, H. H. **Surface culverts for truck roads.** *J. For.* 40, 1942 (267-8). [Black Rock Forest, Cornwall-on-Hudson, N.Y.]

Description of a simple box-type culvert for use in road construction where grades are sharp and damage from run-off may be severe. Such culverts should be given a strong downhill pitch to insure gravity cleaning.

38.3 : 32.91.22 (43.1-5). VOLKERT, E. **Planungsaufgaben an Waldwegen bei Umstellung auf motorisierte Holzaufuhr unter besonderer Berücksichtigung Mittel- und Nordwestdeutschlands.** [The planning of forest roads in conversion to motorized timber extraction, with special reference to Central and North-west Germany.] *Forstarchiv* 16, 1940 (313-31). [G.] R.M.I.

and the raising of the water table. Live remnants exist only where the soil is sandy and drains quickly after floods. A large part of the killed forest has been recolonized by *Fraxinus lanceolata*, *Populus deltoides*, and *Salix nigra*, though a considerable area is too frequently under water to bear any living trees. In spite of the continued deposition of silt, the young forest survives by forming adventitious roots from the stems as the sediment builds up around them.

42.32 (410). SANZEN-BAKER, R. G., and NIMMO, M. **Glazed frost 1940—damage to forest trees in England and Wales.** *Forestry* 15, 1941 (37-54). [Forestry Commission.]

A glazed frost of great severity occurred in January 1940 over a large part of Wales and western and southern England, causing very serious damage to forest trees. Considerable areas of coniferous plantations were completely devastated and a much larger acreage severely damaged. Broadleaved species were affected in the following descending order:—(1) Poplar, (2) Birch, Ash, Sycamore, Alder, (3) Beech, (4) Oak, (5) Elm. The commoner coniferous trees can be similarly grouped:—(1) Japanese Larch, Douglas Fir, (2) European Larch, (3) Sitka Spruce, (4) Scots Pine, Corsican Pine, (5) Norway Spruce.

The most serious damage occurred where the ice thickness was 2-4 in. and some severe damage where it was 1-2 in., but less than 1 in. of ice seldom caused severe breakage except to old broadleaved trees. The greatest devastation occurred at over 1,000 ft. elevation, much severe damage between 500 and 1,000 ft. but little damage below 400 ft. except to Poplars. Eastern aspects and steeper slopes were more seriously affected

and where strong winds occurred the damage was usually greater. Frozen ground, by gripping tree roots, saved large areas of plantations from complete disaster. There was seldom serious damage to trees less than 8 ft. in height; greatest injury occurred to young tree crops 15–35 ft. high and to old woods and shelterbelts. The extent of damage was also influenced by the density and condition of the tree crop, being most serious in the following:—isolated or widely spaced broadleaved trees; densely stocked conifer plantations and such plantations which had just been heavily thinned; plantations of uneven growth, the tallest trees in which sustained the greatest injury. Fortunately for British forestry, widespread meteorological phenomena of such a disastrous type are of rare occurrence.

42.32 : 12.25 : 31.27 : 33.51 : 31.8. RENDLE, B. J., ARMSTRONG, F. H., and NEVARD, E. H. **The utilization of softwood timber damaged in the glazed frost, 1940.** *Forestry* 15, 1941 (55–64). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Mechanical damage to standing softwood timber caused by the glazed frost of January 1940 in Great Britain is described. Investigations of the effect of this damage on the strength of selected material of Japanese Larch and Douglas Fir show that compression failures induced by the weight of ice have little effect on the strength of the timber in the form of pit props. Tests on small clear specimens, however, show a reduction in the modulus of elasticity of the wood from the compression side of the tree, and caution is therefore advised in utilizing timber from affected areas for structural purposes. Apart from possible rupture of the fibres, the quality of the timber in trees permanently deflected as a result of the glazed frost is likely to be adversely affected by the development of compression wood. Callus swellings may develop on stems at points where the tissues have been ruptured. *From authors' summary.*

42.32 : 12.25 (43.1–5). HEGER, H. Beeinflussung der Fichtenwirtschaft der Erzgebirgshochlagen durch Rauheis- und Eisbruch. [Influence of breakage by hoar frost and ice upon the management of Spruce at high altitudes in the Erzgebirge.] *Thar. forstl. Jb.* 91, 1940 (139–202). [G.] R.M.I.

In the district under investigation ice, hoar frost and snow were the most damaging climatic factors. No single type of growth could be distinguished as the most resistant to snow and ice damage. The heathland stands, the most natural form, showed the least breakage, while any interference by man seemed to lead to greater damage. There is also a tendency for natural selection to eliminate the weak trees with poor crowns. A detailed study is made of the local conditions and the effect of breakages in the years 1933–4 and 1938–9.

42.32 : 23.21. HARRER, F. Wiederbestockung der Schneebruchlücken im Alpenvorland. [Restocking gaps caused by snowbreak in the Voralpen.] *Forstarchiv* 16, 1940 (258–60). [G.] R.M.I.

With reference to choice of species. Hemlocks are suggested as suitable for this region; they will stand considerable shade, are quick-growing and yield timber and pulpwood. *Thuja plicata* is recommended for very moist soils. In the young stages both *Tsuga* and *Thuja* need protection from light and exposure. *Cupressus* (*Chamaecyparis*) *lawsoniana* may be worth trying for fairly moist sites with deep, loose soil. *Abies grandis* is

suggested as a suitable substitute for *A. alba*, which has the disadvantage of very slow growth in its young stages; on drier sites *A. concolor* may be substituted.

42.5. Chemical Influences

42.51. ROMELL, L.-G. **Localized injury to plant organs from hydrogen fluoride and other acid gases.** *Svensk bot. Tidskr.* 35, 1941 (271–86). R.A.M. 21 (151–2).

Norway Maples (*Acer platanoides*) and Oaks in a park some 400 m. distant from a factory emitting fluoric gases developed marginal leaf curl, accompanied in the purple-leaved form of the Maple by a dulling of the normal colour of the edges only. Ordinary Norway Maple and the Oaks showed leaf blotches slightly paler than the normal green, while the margins of Apple leaves turned brown and in some cases patches of discoloured tissue were present also on the surface. Analysis of the fluorine contents of (a) visibly damaged parts, (b) remaining parts of the same leaves, and (c) leaves with no apparent injury, gave the following:—ordinary Norway Maple 42, 0, and 0 parts per million dry weight, respectively; purple-leaved Norway Maple 22, 16, and 6; and Apple 17, 0, and 0. The mechanism of the uptake of acid gases is discussed.

43. FOREST FIRES

43 (75) : 60 : 97.1. BICKFORD, C. A. **The use of fire in the flatwoods of the Southeast.** *J. For.* 40, 1942 (132–3). [U.S. Forest Service.]

A note on experiments in the use of controlled burning as an aid to fire protection.

43 (75) : 76) : 60 : 97.1. CONARRO, R. M. **The place of fire in Southern forestry.** *J. For.* 40, 1942 (129–31). [U.S. Forest Service.]

Fire can be used effectively for a number of purposes in the management of Longleaf and Slash Pine stands so long as its use is carefully planned in relation to its known effects and the influence of weather conditions on its behaviour.

43 (79.2) : 11.6. BUHLER, E. O. **Forest and watershed fires in Utah.** *Circ. Utah agric. Exp. Sta.* 115, 1941. pp. 27.

From a recent study of the fire situation in Utah forests essential in watershed protection, preliminary suggestions are made for an extension of protective measures to be financed jointly by the State and Federal Governments in accordance with the provisions of the Clarke-McNary Act.

43.1. Protective Measures

43.12 : 38.2. YOUHOTSKY, M. J. **Novel lookout tower.** *Aust. Timb. J.* 7, 1941–42 (558–9). [Forestry Commission of New South Wales.]

The 62-ft. tower described was assembled from sawn timber in light sections, using 'Teco' steel split-ring connectors. It has vertical sides, which is considered an improvement aesthetically.

43.13 : 82 : 81. SCHROEDER, G. H. **The progressive method of forest fire control.** *J. For.* 40, 1942 (11–4). [Oregon State College.]

The selection, training and supervision of the 'progressive' crew and the most efficient division of labour are the important factors in this method. Each member is given a job according to his training and ability and is directed in his work so that he does it

without hesitation or interfering with the work of his neighbour. Thus all aspects of fire-suppression work are undertaken by the crew and completed in a minimum of time.

44. DAMAGE BY HARMFUL PLANTS.

VIRUS DISEASES

44.0. Climbers and Epiphytes

44.0 : 12.26-8 : 42.22. FEATHERLY, H. I. The effect of grapevines on trees. *Proc. Okla. Acad. Sci.* 21, 1941 (61-2). L.S.

Ring counts showed that both dead trees and live trees with 'grapevines' on them had grown more slowly than live trees with no 'grapevines'. Death is attributed to the combined effects of suppression by the vines and a sequence of drought years between 1934 and 1936. The trees involved were American Elm and Hackberry.

44.2. Parasitic Higher Plants

44.2 : 12.25 : 12.26-8. GILL, L. S., and ANDREWS, S. R. Behavior of dwarf mistletoes of western conifers in relation to control. *Abstr. in Phytopathology* 32, 1942 (21-2).

A study was made in 1939 of the behaviour of *Arceuthobium vaginatum* forma *cryptopodum* in an understorey of seedlings and saplings on a 60-acre area of Ponderosa Pine, in northern Arizona, where a heavily infected stand had been cut over 30 years earlier. Most of the second growth had not become established until some time after the original cutting, and infection was unusually low, being for the greater part restricted to stands within a radius of 50 ft. from infected overstorey trees. As almost all infections were recent, the parasite had no significant influence on the height of the seedlings. However, 70 per cent. of the infections occurred on the main stems of seedlings and will eventually cause deformity or a serious reduction in growth, if not death. Furthermore, about half of the branch infections were so close to the stems as to imply extension of the endophytic system into the latter.

44.2 : 12.26-8. MADRAS. Annual report on silvicultural research in the Madras Presidency for the year 1940-41. Supt., Govt. Press, Madras. 1942. pp. 146.

Control of *Loranthus* in Teak plantations was brought about by cutting the affected branches 1 ft. above the pest and laying the cut branches in an open space where they dried up without producing flowers or fruit (p. 84).

44.3. Fungi

44.3 (71). CANADA. Twentieth annual report of the Canadian Plant Disease Survey, 1940. Division of Botany & Plant Pathology, Science Service, Department of Agriculture, Ottawa. 1941. pp. 104.

Includes a section on diseases of forest and shade trees. Among the new or noteworthy diseases are *Rhizosphaera kalkhoffii* on Blue Spruce in Quebec, and *Physalospora miyabeana*, particularly the *Gloeosporium* stage, and *Fusicladium saliciperdom* on Willow in British Columbia.

44.3 (71.1). BIER, J. E. Forestry pathology in British Columbia. *B.C. Lumberm.* 26 (2), 1942 (25-6).

A review of those aspects of forest pathology applicable to British Columbia. It is noted that damping-off of stratified Douglas Fir seed may be controlled by sowing the seed on a $\frac{1}{4}$ -in. layer of peat moss and

covering with the same material. The most important disease of young Douglas Fir appears to be the root rot caused by *Poria weirii*.

44.3 : 12.25 : 12.21 : 23.26. DAVIS, S. H. *Sclerotium bataticola*, a cause of damping-off in seedling conifers. *Science* 95, 1942 (70). L.S.

Cultures of *Sclerotium bataticola* Taub., isolated in 1935 from *Picea abies* seedlings, have been tested on seeds and young seedlings of *Pseudotsuga taxifolia*, *Picea abies*, *Larix laricina*, *Pinus banksiana*, *P. resinosa*, *P. sylvestris*, and *P. ponderosa*. Pre-emergence and post-emergence damping-off occurred in all of the species named, and *S. bataticola* was reisolated from all stages of damped-off seedlings.

44.3 : 12.25 : 12.21 : 23.26. ROTH, L. F., and RIKER, A. J. The influence of temperature, moisture, and soil reaction on damping-off of Red Pine by *Pythium* and *Rhizoctonia*. *Abstr. in Phytopathology* 32, 1942 (15-6).

Pythium irregulare and *Rhizoctonia solani* have been the chief causes of damping-off in Wisconsin forest nurseries. Greenhouse studies with Red Pine sown in Plainfield sand showed that within limits the maximum damping-off from *Pythium* took place below 24° C. and that from *Rhizoctonia* above this temperature. Soil moistures somewhat less than 70 per cent. of the moisture-holding capacity favoured *Rhizoctonia* and those above this level were favourable to *Pythium*. The former was favoured and the latter uninfluenced by saturated air humidity. Within limits, soils more acid than pH 5.8 were favourable to *Rhizoctonia* and those more alkaline were favourable to *Pythium*. The Red Pine seedlings grew well between about 15° and 30° C., with medium moisture and a pH of about 4.7-6.0.

44.3 : 12.25 : 12.21 : 23.26. SLAGG, C. M., and WRIGHT, E. *Diplodia epidemic in conifer seedbeds*. *Abstr. in Phytopathology* 32, 1942 (16-7).

Dead and dying seedlings of *Pinus nigra*, *P. ponderosa*, *P. edulis* and *Pseudotsuga taxifolia* in a nursery at Manhattan, Kansas, were found to be infected with a fungus identified as *Diplodia pinea* (*Sphaeropsis ellisii*). The same fungus was found on 2- to 3-year-old *Pinus sylvestris*, *P. ponderosa*, and *P. nigra* at the nursery and on 10- to 50-year-old trees of the same three species on the campus of Kansas State College. Injury in the seedbeds was most severe on *Pinus nigra* and *Pseudotsuga taxifolia*, approximately 50 per cent. of the seedlings being diseased or dead. Disease symptoms were reproduced in 5 days on similar seedlings of *P. nigra* from uninfected nursery stock inoculated with cultures of the fungus.

44.3 : 12.25 : 12.21 : 23.26. DAVIS, S. H., and HARRY, J. B. A *Xylaria* pathogenic to *Ginkgo biloba* L. seeds. *Phytopathology* 32, 1942 (91-3). [University of Pennsylvania, Philadelphia.]

A species of *Xylaria*, provisionally identified as *X. longeana*, was isolated in 1938 from dying and dead branches of a specimen of *Ginkgo biloba* and has proved to be pathogenic to seeds of that species, reducing seedling emergence to about 2 per cent. as against 32-55 per cent. in controls. Inoculation tests on seedlings and mature trees are still in progress.

44.3 : 12.25 : 12.21 : 23.26. WRIGHT, E., and SLAGG, C. M. Some tentative conclusions resulting from plot analyses of *Phomopsis*-blighted Juniper seedlings in

Great Plains nurseries during 1941. *Abstr. in Phytopathology* 32, 1942 (19).

One-year-old seedlings of *Juniperus virginiana* from Kansas seed proved no more resistant to infection by *Phomopsis juniperovora* than those from Nebraska seed. *J. scopulorum*, previously not sprayed because it was considered highly resistant, was so severely infected that spraying will be necessary in future. Infection of seedlings generally began at the edge of the seedbeds, later working inwards, and appeared to be directly associated with water splashing. Seedlings watered by overhead irrigation were more severely attacked than those watered by ditch irrigation; dense stands, presumably because they reduce splashing, tended to retard rather than to increase the percentage of infection. Roguing of diseased plants was not significantly beneficial, except where infection was comparatively light. Of various sprays used, commercial bordeaux (5-5-50) gave most promise for control.

44.3 : 12.25 : 12.21 : 12.26-8 : 12.11.11. OFFORD, H. R. The function of tannin in host-parasite relationships with special reference to *Ribes* and *Cronartium ribicola*. Bureau of Entomology & Plant Quarantine, U.S.D.A., Washington, D.C. No. E-518, 1940. pp. 27.

Evidence shows that the chemical properties of tannins and their degradation products, their probable function in the plant, and their action on pathogenic fungi lend themselves to an explanation of the specificity exhibited in host/parasite relationships. A theory is offered that postulates a toxic action of tannin initiated and conditioned by enzymes or hormones secreted by the fungus. The ultimate toxicity of the tannins would appear to depend partly on the type of phenolic and other potentially toxic constituents formed by the reaction of host and parasite, and partly on the quantity and manner of distribution of the tannin mass. *From author's summary.*

44.3 : 12.25 : 12.21. BAGCHEE, K. Contributions to our knowledge of the morphology, cytology and biology of Indian coniferous rusts. Part I. *Cronartium himalayense* Bagchee and *Peridermium orientale* Cooke on *Pinus longifolia* Roxb. *Indian For. Rec. (n.s.) Botany* I, 1941 (ii + 247-66). [Forest Research Institute, Dehra Dun.]

Cronartium himalayense Bagchee, on species of *Swertia*, has already been established as the alternate stage of *Peridermium himalayense* Bagchee, which causes a stem blister rust of *Pinus longifolia*. Inoculation experiments described in the present paper have now shown the Pine host to be highly susceptible to infection by spores of the *Cronartium* stage. A further series of experiments has demonstrated that the alternate stage of *Peridermium orientale* Cooke, the cause of a needle rust of the same species of *Pinus*, is *Coleosporium campanulae* (Pers.) Lév. on *Campanula colorata* Wall. The morphologically identical *Coleosporium campanulae* on *Campanula canescens* Wall. is shown to be a distinct form physiologically, and inoculations of this form on both *Pinus longifolia* and *Campanula colorata* failed to produce infection, as did also inoculations of *Campanula canescens* with the form from *C. colorata*. Three appendices are given to summarize present knowledge of Indian coniferous rusts and their alternate stages and host species.

44.3 : 12.25 : 12.21. ANDREWS, S. R., and GILL, L. S. Western red rot in Ponderosa Pine in Arizona and New Mexico. *Abstr. in Phytopathology* 32, 1942 (20).

This rot, caused by *Polyporus ellisianus*, accounts for the major part of the 25-per-cent. defect frequently found in mature and overmature Ponderosa Pine stands in the south-western United States. Studies to ascertain its importance in immature stands have shown that since the infection takes place almost exclusively through dead branches, initial infection is highly dependent on the branch habit and but slightly so on age and suppression. Among trees 41 to 100 years old, 8.0 per cent. of those with dead branches all under 1.1 in. in basal diameter showed infected branches, as compared with 33.8 per cent. of those with one or more branches larger than that size. Although infection was also correlated with tree age, size, and stand density, this may be attributed to high correlation between these factors and branch habit. Age alone was found to be highly correlated with the progress of decay in the heartwood of the trunk. In a second cutting of a tract in northern Arizona, the proportions of gross volume lost on account of this rot were 0.8 per cent. in trees 121-150 years old, 4.6 per cent. in those 151-180 years old, and 10.3 per cent. in those 241-270 years old. It would appear that losses may be rather less severe in second-growth than in virgin stands, and that they can be further reduced if stands are kept dense enough to inhibit the formation of large branches, pruned early, and cut before they are overmature. [Cf. *For. Abs.* 3 (340).]

44.3 : 12.25 : 12.21. TERRIER, C. A. Über das Auftreten der *Rhabdocline*-Douglasienschütte in der Schweiz. [On the occurrence in Switzerland of the *Rhabdocline* needle-cast disease of Douglas Fir.] *Schweiz. Z. Forstw.* 93, 1942 (14-8). [G.]

Simultaneous attack of the same trees and even the same needles by *Phaeocryptopus gaeumannii* and *Rhabdocline pseudotsugae* is reported from a nursery near Lausanne. It is presumed that the *Rhabdocline* was introduced with the trees when these were imported as three-year-old plants from Schleswig-Holstein in 1933. In the meantime infected Douglas Fir trees have been sent from the Lausanne nursery to a place near Zurich, so that at present there are two *Rhabdocline* infection centres in Switzerland.

44.3 : 12.26-8 : 12.21. THIRUMALACHAR, M. J. *Haplophragmium ponderosum* Syd. on *Acacia leucophlaea* Willd. *J. Indian bot. Soc.* 20, 1941 (293-8). [Department of Botany, Central College, Bangalore.] L.S.

Notes on the rust fungus *H. ponderosum*, which infects *Acacia leucophlaea* and causes tumours on the branches, flowers, and pods. The anatomical and developmental features of the tumours resemble those of crown gall caused by *Bacterium tumefaciens*.

44.3 : 12.26-8 : 12.21. HOWARD, F. L. Antidoting toxin of *Phytophthora cactorum* as a means of plant disease control. *Science* 94, 1941 (345). R.A.M. 21 (104).

The toxic effect of filtrates of liquid media in which *Phytophthora cactorum* had grown was inactivated by the addition of 0.5 per cent. aqueous solution of the dihydro-chloride salt of di-amino-azo-benzene plus a solvent and penetrant ('helione orange'). Healthy Maple trees injected with the toxic filtrate died, whereas those injected with the filtrate to which the salt had been added remained unharmed. Over 350 Maple trees naturally infected with *P. cactorum* stopped 'bleeding' and improved markedly in growth when injected with the chemical. It is not yet clear whether the trees were definitely cured.

44.3 : 12.26-8 : 12.21. CAROSELLI, N. E., and HOWARD, F. L. Response of diseased Maple trees to chemotherapy and fertilization. *Abstr. in Phytopathology* 32, 1942 (21).

In Maples infected with the bleeding canker disease, average twig elongation over the 6-year period 1936-41 gradually decreased in untreated trees to about half its initial value; in trees given crowbar fertilizer treatment but not injected it dropped to a minimum; and in those injected with chemicals [not specified], whether fertilized or not, it increased slightly in the current year and markedly during the following year. Healthy trees showed approximately uniform twig growth over the period.

44.3 : 12.26-8 : 12.21. MILLER, P. A. Bleeding canker disease of California trees. *Repr. from Proc. 8th Western Shade Tree Conf.* 1941 (39-45). [University of California, Los Angeles.]

Bleeding canker disease due to a species of *Phytophthora* tentatively identified as *P. cinnamomi* has been observed in California on *Quercus agrifolia*. Similar diseases have been noted in *Eucalyptus ficifolia* and *Sterculia diversifolia*, but the pathogen has not yet been isolated from these species. From the present known range of the Oak disease it appears that the cool, moist coast climate is favourable to infection and the development of the disease; wet soil conditions are also favourable. Control measures should be designed to avoid excessive moisture in the root zone. Experiments on injection treatments are being conducted.

44.3 : 12.26-8 : 12.21. UNION OF SOUTH AFRICA. Department of Agriculture and Forestry, Division of Forestry. Annual report for the year ended 31st March, 1941. Govt. Printer, Pretoria. 1941. pp. 18.

Quercus palustris, *Q. suber*, *Q. serrata*, and *Q. ilex* appear to be immune from attack by the mildew *Oidium* sp. (p. 10).

44.3 : 12.26-8 : 12.21. MILLER, P. A. An important powdery mildew disease of the Coast Live Oak. *Repr. from Proc. 6th Western Shade Tree Conf.* 1939. pp. 5. [University of California, Los Angeles.]

Sphaerotheca lanestrus causes a powdery mildew disease of the young foliage of various native and introduced species of Oak in California. *Quercus agrifolia* appears to be the most severely attacked, though susceptibility varies both in different species and in different trees of the same species. Cool, moist climatic conditions are believed to be most favourable for the development of the fungus. As the disease attacks only the new growth, overstimulation of growth should be avoided, especially during the winter and spring months. Severe pruning and excessive fertilizing, particularly with high-nitrogen fertilizers, are likely to encourage attack. Infestation by insect pests may increase susceptibility by causing summer and autumn flushing. The possibility is mentioned of using only resistant species or strains of Oak for shade-tree plantings. Satisfactory sprays have not yet been found.

44.3 : 12.26-8 : 12.21. MILLER, P. [A.]. Recent advances in our knowledge concerning the Oak mildew disease. *Repr. from Proc. 7th Western Shade Tree Conf.* 1940 (64-71). [University of California, Los Angeles.]

A progress report on experiments on spraying, removal of infected growth, and fertilizing, in connexion with the powdery mildew disease [cf. preceding

abstract], with notes on meteorological conditions and variation in seedling resistance. No conclusive results have yet been obtained from this work.

44.3 : 12.26-8 : 12.21. WEBER, G. F. Leaf blister of Oaks. *Pr. Bull. Fla. agric. Exp. Sta.* No. 558, 1941. pp. 2. R.A.M. 21 (232).

Taphrina coerulescens produces variously coloured blisters on the new foliage of species of Oak in Florida. Infection is largely confined to the leaves developing in early spring from the dormant buds and to those next produced on the new shoots. Direct control measures are applicable only to small trees of particular value: fallen leaves should be removed and a standard fungicide, e.g. 4-4-50 Bordeaux mixture, sprayed over the buds a week or ten days before they begin to swell, followed if necessary by a second treatment before full expansion of the foliage.

44.3 : 12.26-8 : 12.21 : 23.26. ROLDAN, E. F. Nursery wilt of Mahogany seedlings. *Philipp. J. For.* 4, 1941 (267-77). [Bureau of Forestry, Philippines.]

Description of the disease as observed in a Philippine nursery and of its causal organism *Sclerotium delphini* Welch. Various control measures are suggested.

44.3 : 12.26-8 : 12.21 : 23.26. WRIGHT, E. *Chalaropsis* root rot of Chinese Elm. *Amer. Nurseryman* 75 (1), 1942 (7-9).

Chalaropsis thielavioides Peyronel causes a serious storage root rot of nursery stock of *Ulmus pumila* in the United States. Dips such as mercuric chloride, Semesan, formaldehyde, Bordeaux, lime-sulphur, boric acid, and sodium perborate have failed to give satisfactory control. In northern nurseries the best control has been obtained by storing the stock indoors at low humidity and at temperatures between 35° and 38° F. or by storing outdoors in deep heel-in beds of fine, sandy, well drained soil covered with a straw mulch. In southern nurseries the stock is best left in place until spring and dug just before planting time. Excessive wounding and freezing are especially to be guarded against.

44.3 : 12.26-8 : 12.21. Dutch Elm disease in 1941. *Plant Dis. Repr.* 25, 1941 (450-1). R.A.M. 21 (231-2).

A map compiled from weekly reports of the Bureau of Entomology and Plant Quarantine from 8th September, 1940, to 13th September, 1941, shows the spread of Dutch Elm disease in the United States over that period.

44.3 : 12.26-8 : 12.21. ZENTMYER, G. A. Toxin formation and chemotherapy in relation to Dutch Elm disease. *Abstr. in Phytopathology* 32, 1942 (20).

Ceratostomella ulmi was found to produce in culture a toxin that wilted plant cuttings and evoked symptoms similar to those of Dutch Elm disease when injected into Elms. In chemical treatment of 850 small American Elms, 5 out of 25 organic chemicals gave promise of preventing or retarding the disease. Injection of hydroquinone, benzoic acid, or p-nitrophenol, one week before inoculation with the fungus, greatly reduced the percentage of trees showing disease symptoms. When 50 trees were injected with 8-hydroxyquinoline sulphate and simultaneously inoculated, the appearance of symptoms was retarded by 2½ weeks as compared with controls. When inoculated trees were injected with benzoic acid, hydroquinone, or 8-hydroxyquinoline benzoate at the onset of wilting, the further advance of wilting was markedly retarded.

Results indicate that once the disease is well established, the possibilities of checking its advance by chemotherapy are considerably reduced.

44.3 : 12.26-8 : 12.21. **Chemical may control deadly Elm disease.** *Science News Letter* 41 (1), 1942 (14). L.S.

At the Connecticut Agricultural Experiment Station it has been found that characteristic wilting developed when cuttings of various plants were dipped in a filtered extract from laboratory cultures of *Ceratostomella ulmi*. Wilting and staining of the wood were observed when the extract was injected into small trees growing outdoors. These results make it probable that wilting is due to a toxin rather than to simple mechanical clogging of the sap channels. [Cf. preceding abstract.]

44.3 : 12.26-8 : 12.21. SIBILIA, C. *L'Ulmus pumila e la grafiosi. [Ulmus pumila and the Dutch Elm disease.] Boll. R. Staz. Patol. Veg.* 18 (2), 1940 (147-9). [It.] Biol. Abs. 16 (2956).

Ulmus pumila is highly resistant though not immune to infection by *Ceratostomella ulmi*; the few cases of infection can be explained as seedling variations. The value of the species is still great, especially in view of its successful use as a stock for the Buisman Elm.

44.3 : 12.26-8 : 12.21 : 13.15 : 13.2. **Department of Entomology.** *Bull. Mass. agric. Exp. Sta.* 369, 1940 (45-50, 57-66). R.A.E. A30 (76-9).

Records are given of the course of development in Elm logs of *Hylastes (Hylurgopinus) rufipes* Eichh. and *Scolytus multistriatus* Marsh., which are concerned in the dispersal of *Ceratostomella ulmi*. To determine the effect of solar heat on the subcortical development of *H. rufipes*, infested logs were placed on open ground or under the shade of a tree. In the sun, complete mortality occurred in the upper halves of all logs but one, which had relatively thick bark and was exposed for only one day. Living individuals were found in the lower halves of the logs in the sun and both halves of logs in the shade, and later the shaded bark showed emergence holes, indicating that the beetles had completed their development.

44.3 : 12.26-8 : 12.21 : 13.15 : 13.2. COLLINS, C. W. **Studies of Elm insects associated with Dutch Elm disease fungus.** *J. econ. Ent.* 34, 1941 (369-72). R.A.M. 21 (104).

According to unpublished observations, *Ceratostomella ulmi* was obtained from 6.9, 5.8, 7.7, and 5.1 per cent. of the *Scolytus multistriatus* beetles and from 4.3, 2.4, 3.3, and 0.7 per cent. of *Hylurgopinus rufipes* collected on felled healthy Elm trees in New Jersey and cultured in 1936, 1937, 1938, and 1939, respectively. Of numerous other species of insects taken in 1936, only small percentages of the following were contaminated by the fungus:—*Xylosandrus germanus*, *Xylobiops basilare*, *Magdalis armicollis*, and *Conotrachelus anaglypticus*. Particulars are given of the methods employed by the beetles in boring into the trunks and limbs of Elm trees, their breeding and feeding habits in relation to the transmission of *C. ulmi*, and the possibilities of control by means of insecticides.

44.3 : 12.26-8 : 12.21 : 13.2. NEW YORK. **Cornell University Agricultural Experiment Station. Fifty-fourth annual report, 1941.** Ithaca, N.Y. 1942. pp. 202.

As a factor in the control of the Dutch Elm disease, a mixture of creosote, paradichlorobenzene, light petroleum oil, and paraffin may be sprayed on logs,

under suitable conditions, to prevent Elm beetle entry and to kill beetles already present. The causal fungus of the Dutch Elm disease can exist saprophytically in Apple wood and can be carried out in viable form by *Scolytus sulcatus* (p. 130).

44.3 : 12.26-8 : 12.21 : 13.15. BUCHANAN, W. D., and MAY, C. **Technique for artificially feeding *Scolytus multistriatus* and *Saperda tridentata* spores of *Ceratostomella ulmi* and other substances.** *Phytopathology* 32, 1942 (95-7). [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

A technique has been devised for feeding these beetles under conditions precluding external transfer of the fungus or other substances from the mouth parts to the posterior portion of the body and faecal pellets. Active, recently emerged adults, free of *Ceratostomella ulmi* are stuck with cellulose glue to the ends of tapered matchsticks, the legs being fastened to the end of the stick and the head and posterior part of the abdomen left free. The stick plus beetle is then mounted upright on a stand carrying a glass tube loaded with the substances to be ingested, the tube being adjusted so that the head of the beetle is just inside the open end. Air currents and dust were kept from the apparatus by a celluloid cover. Beetles freely took food for as much as 15 days and water and other substances for several days while thus mounted. In other experiments predetermined quantities of spore suspensions were injected directly into the mouths of the beetles with the aid of a micromanipulator and a micropipette. The entire posteriors of the beetles were frequently surface-sterilized by brushing with 95-per-cent. alcohol.

44.3 : 23.27. YAHRES, G. VAN. **Treating decay cavities in trees.** *U.S. Patent No.* 2,258,693, Oct. 14, 1941. Chem. Abs. 36 (612). P.R.

Description of apparatus and a method that involves closing the mouth of the cavity, passing heated air through it, filling it with a disinfectant fluid such as alcohol or a HgCl₂ solution, removing this fluid, and introducing in liquid form a material such as melted paraffin that is adapted to solidify in the cavity.

44.4. Virus Diseases

44.4 : 12.26-8. GRANT, T. J., STOUT, D. C., and READEY, J. C. **Systemic brooming, a virus disease of the Black Locust.** *J. For.* 40, 1942 (253-60). [Soil Conservation Service.]

An account of the disease is given with reference to occurrence, means of identification, symptoms and behaviour in different parts of the plant, means of transmission, and relative importance. Positive transmission has been obtained by grafting and to a very limited extent by budding.

45. DAMAGE BY ANIMALS

45.1. Mammals

45.12 : 13.2 : 13.15. PENNSYLVANIA. **Science for the farmer: 54th annual report of the Pennsylvania Agricultural Experiment Station for the fiscal year ended June 30, 1941.** *Bull. Pa. agric. Exp. Sta.* No. 414, 1941. pp. 63. A.P.B.

In a study of the damage caused to vegetation by the feeding of rodents and deer it was found that the former showed a preference for seedlings of White Oak, Black Walnut, and White Ash, while White Pine, Pitch Pine, White Ash, and Sugar Maple were most extensively browsed by deer (p. 22).

45.12 : 13.2. PARKER, L. A. Factors causing rodent damage to tree plantations in southeastern Minnesota. *Repr. from J. Wildlife Management* 5, 1941 (297-303). [Division of Game & Fish, St. Paul, Minn.]

A survey of rodent damage to seedlings in areas planted by the Soil Conservation Service in south-eastern Minnesota revealed that tree species, density of cover, slope direction, and past land use are the principal factors that influence damage by mice and rabbits. Conditions most conducive to damage by mice were found on level or north-facing lands, formerly cultivated, covered with dense herbaceous vegetation, and planted with *Prunus virginiana*, *Ulmus pumila*, or *Acer saccharinum*. Ideal conditions for rabbit attack prevailed in formerly idle areas, with thin vegetation, planted with *Rosa setigera*, *Celtis occidentalis*, or *Fraxinus pennsylvanica* var. *lanceolata*.

45.12 : 13.2. Protection of tree seedlings from rabbits. South Dakota Extension Service, State College, Brookings, S. Dak. No. B-45, 1941. pp. 5.

Notes on shooting and trapping, poisoning, and the use of repellents. Included are details of a repellent recommended by the Wildlife Research Laboratory, Fish and Wildlife Service, U.S. Department of Agriculture. This repellent may be used either in paint or in spray form.

45.3. Insects

45.3 : 07.2. GENEST, M.-E. L'utilité des places d'étude permanentes en entomologie. [The utility of permanent study sites in entomology.] *Repr. from Nat. canad.* 68, 1941 (261-71). [F.] [Service d'entomologie, Département des terres et forêts, Québec.]

Such sites have been established in Quebec for some years, and since spring, 1940, a special section of the Entomological Service has been in charge of their regular inspection. Observations on forest insects are made and recorded according to a standardized procedure, which is described in detail.

45.3 : 12.12. NEMETH, F. F. Insect galls of West Virginia. I. Galls on *Ulmus*, *Hamamelis*, *Rubus* and *Prunus*. *Castanea* 7, 1942 (16-9).

Twelve insect galls are described.

45.3 : 12.25 : 13.2. NOVA SCOTIA. Report of the Department of Lands and Forests [1940-] 1941. King's Printer, Halifax. 1942. pp. 83.

The European predacious insect *Leucopis obscura* has been established in Nova Scotia and New Brunswick and in the latter province it has been effective in checking the Balsam woolly aphid (*Adelges piceae*) (p. 36). The black-headed budworm (*Peronea variaria*) has caused considerable mortality in even-aged Balsam Fir over 60 years old (p. 36).

45.3 : 12.25 : 13.2. FERGUSSON, J. L. F. Pine weevil damage in a young plantation. *Scot. For. J.* 55, 1941 (80-1).

Account of damage, chiefly from *Hyllobius abietis*, during the 3 years after planting, and of control measures adopted. The plantation is located in Perthshire and consists mainly of hybrid Larch.

45.3 : 12.25 : 13.2. BALCH, R. E., REEKS, W. A., and SMITH, S. G. Separation of the European Spruce sawfly in America from *Gilpinia polytoma* (Htg.) (Diprionidae,

Hymenoptera) and evidence of its introduction. *Repr. from Canad. Ent. Nov.*, 1941 (198-203). [Dominion Entomological Laboratory, Fredericton, N.B.]

A further discussion of the investigations reported by Smith [cf. *For. Abs.* 3 (166).]

45.3 : 12.25 : 13.2. HETRICK, L. A. Forest insect investigations of the Virginia Agricultural Experiment Station. *Abstr. in Proc. ent. Soc. Wash.* 43, 1941 (168). L.S.

An endoparasitic nematode of the genus *Anguillonema* and an entomophagous fungus of the genus *Beauveria* were found to be the most important agents of mortality in the overwintered brood of *Dendroctonus frontalis* and the ultimate subsidence of the epidemic in the summer of 1939; insect parasites of this beetle were of little importance in natural control. Studies are being made of the life history of Pine-defoliating sawflies. The most important of these is *Neodiprion americanum*, which is single-brooded and defoliates Pines during May. The larvae consume the old needles and the developing new growth provides for the requirements of the trees; Pines are not killed by repeated defoliation and no bark-beetle outbreaks have followed the sawfly injury though the increment of defoliated trees is reduced. The effects of low temperatures in January, 1940, on overwintering pupae of *Rhyacionia frustrana* have also been studied. Many of the pupae were dead in the shoots but their insect parasites showed a comparatively high survival. However, infestation of Pine shoots by this species during the summer of 1940 was comparable to that of the previous year. *R. frustrana* had three generations in most of the localities studied during 1940, but only two generations in a few of the areas.

45.3 : 12.25 : 13.2. SPEERS, C. F. The Pine spittle bug (*Aphrophora parallela* Say). *Bull. N.Y. St. Coll. For.* 14 (2-a) [Tech. Publ. No. 54], 1941. pp. 65.

A. parallela, native to the eastern coniferous zone of the United States and Canada, is the worst pest of *Pinus sylvestris* in that region, killing trees within 2-3 years of the first signs of damage if its attacks are sustained. It is able to feed on many other species of conifers, new hosts recorded in the present paper being *Larix decidua*, *Pinus contorta*, *P. densiflora*, *P. flexilis*, *P. nigra*, *P. ponderosa*, *P. thunbergii*, and *Tsuga canadensis*. Planting of other conifers in mixture with *P. sylvestris* is thus useless as a control measure. Under forestry conditions silvicultural control is the only practical method. Vigorous growth should be encouraged by timely thinnings; cleaning up the stand by removing dead and dying branches, dying trees, and similar sanitary practices will keep down the spittle-bug population, as such material is favoured for oviposition. Control on ornamental trees may be obtained by spraying, preferably in early June, with 'Evergreen' pyrethrum extract; this type of control may also be applied to small isolated woods where there is little danger of reinfestation.

45.3 : 12.25 : 13.2 : 44.3 : 12.21. HADDOW, W. R. Needle blight and late fall browning of Red Pine (*Pinus resinosa* Ait.) caused by a gall midge (Cecidomyiidae) and the fungus *Pullularia pullulans* (de Bary) Berkhout. *Trans. R. Canad. Inst.* 23, 1941 (161-92). R.A.E. A30 (113-4).

The southern Ontario plantations of Red Pine, 2-25

years old, have suffered intermittently since 1932 from two maladies of the current season's foliage—needle blight, which affects the lower part of the needles, causing them to become hooked and to drop—and late fall browning, which occurs later in the season and is characterized by a browning of the whole plantation as if by fire. The resulting defoliation would kill the trees if it occurred in several successive seasons. Both types of injury were found to be associated with an unidentified Cecidomyiid closely related to *Thecodiplosis piniradiatae* and *T. brachytera*. It was found to have one generation a year. The adults emerge from the soil in spring or early summer and oviposit in the sheath of scales at the base of the needles. Larvae hatch in July and form cavities at the needle base. In October or later they drop to the ground and pupate and overwinter near the top of the mineral soil. Late fall browning is a direct effect of injury by the larvae, but needle blight is caused by invasion of the bases of the shoots by *Pullularia pullulans*, which is commonly present on the sheath scales. The circumstances leading to this invasion are not known, but evidence indicates that infestation by the Cecidomyiid provides favourable conditions for it, though the larva is apparently killed while quite small in the process of development of the lesion. The absence of mortality among the trees at one locality where the Cecidomyiid has been present for 8 years is attributed to control by insect parasites. Those obtained were *Platygaster filicornis* Ashm., undoubtedly a primary parasite, and a species of *Inostemma* tentatively identified as *I. lintneri*.

45.3 : 12.25 : 13.2. OSSOWSKI, L. The Pine shoot beetles. *Scot. For. J.* 55, 1941 (75-9).

After a short statement on *Myelophilus piniperda* and *M. minor*, and a reference to the natural enemies of bark beetles, the author deals with preventive and remedial measures. Among the former he strongly recommends the avoidance of pure coniferous woods, the removal of fallen trees and slash, and the barking of all timber and firewood left in the woods later than 1st March. As remedies he advocates the use of two kinds of trap tree (standing and lying) giving details of each. *Author's summary.*

45.3 : 12.26-8 : 13.2. MARSHALL, SIR G. A. K. New injurious Curculionidae (Col.) from the Sudan. *Bull. ent. Res.* 33, 1942 (1-3).

Including *Sibinia vitticollis* and *S. brunnulla* on *Acacia arabica*.

45.3 : 12.26-8 : 13.2. NOBLE, N. S. *Trichilogaster maideni* (Froggatt) (Hymenopt., Chalcidoidea), a wasp causing galls on *Acacia implexa* Benth., and *A. maideni* F. v. M. *Proc. Linn. Soc. N.S.W.* 66, 1941 (18-200). [University of Sydney.] L.S.

An account is given of the life history of this wasp, which causes galls on the phyllode petioles of *Acacia implexa* and on the stems of *A. maideni*. Notes are included on associated species and on the types and development of Chalcidoid galls on Australian tree species. [Cf. *For. Abs.* 3 (254).]

45.3 : 12.26-8 : 13.2. WHITNEY, W. R. Isn't research fun? *Carib. For.* 3, 1941-42 (47-57).

Note on the feeding cavities and exit holes of *Lagochirus araneiformis* L. in the bark of *Bursera simaruba* L.

45.3 : 12.26-8 : 13.2. WOLCOTT, G. N., and MARETTORELL, L. F. The accidental introduction of a beneficial insect into Puerto Rico. *Carib. For.* 3, 1941-42 (58-60). [E.e.span.] [Agricultural Exp. Sta., Rio Piedras, Puerto Rico.]

Chalcopidius silbermanni Chevrolat was observed preying on the larvae of *Lagochirus araneiformis* L.; the former insect is presumed to have been introduced with timber imported from Hispaniola.

45.3 : 12.26-8 : 13.2. UNION OF SOUTH AFRICA. Department of Agriculture and Forestry, Division of Forestry. Annual report for the year ended 31st March, 1941. Govt. Printer, Pretoria. 1941. pp. 18.

Economic control of the Eucalyptus snout beetle (*Gonipterus scutellatus*) has been established over a wide area by the introduced mymarid egg parasite (p. 14).

45.3 : 12.26-8 : 13.2. SMITH, R. H. Sycamore scale in California. *Pacific Rural Press* 141 (12), 1941 (439). *Biol. Abs.* 16 (5635).

Stomococcus platanus is the most injurious insect that attacks Sycamore (Plane) foliage in California. *Platanus orientalis* is more heavily infested than the native species, *P. racemosa*. The most effective control is a dormant oil emulsion (3 gal. to 100) applied in January, though spring and summer spraying will give a considerable measure of control if done when the insects of a generation are present on the leaves.

45.3 : 12.26-8 : 13.2. ADAMS, L. E. Spring canker-worm investigations in Missouri. *Proc. Mo. Acad. Sci.* 6, 1941 (78-9). R.A.E. A30 (115).

Infestation by *Paleacrita vernata* Peck has increased in Missouri and in 1939 many trees of *Ulmus americana* were completely defoliated by this Geometrid at Columbia. In 1940 the outbreak was the most severe since that of 1870-75. Experiments on banding of the trees are described and data are given on time of emergence, number of eggs per female, and period required for hatching.

45.3 : 13.15 : 13.2. LAIDLAW, W. B. R. Aids to natural forest protection. *Scot. For. J.* 55, 1941 (51-60).

The author emphasizes the value of birds in the control of insect pests; he includes two keys to insects of importance in forestry—one in the non-adult stage, the second in the adult stage. Notes are included on artificial controls.

45.3 : 13.15 : 13.2. SHADLE, A. R. Rodents as insect control factors in Allegany Park, New York. *J. For.* 40, 1942 (269). [University of Buffalo.]

Chipmunks, squirrels, deer mice and white-footed mice destroy large numbers of forest insects in all stages of development, the white-footed mice and flying squirrels being particularly destructive to nocturnal insects.

45.3 : 23.27. FELT, E. P., and BROMLEY, S. W. Major shade tree insects of 1940. *J. econ. Ent.* 34, 1941 (180-1). R.A.E. A30 (120).

Notes are included on *Galerucella luteola* (*xanthomelaena*), *Hylastes* (*Hylurgopinus*) *rufipes*, *Popillia japonica*, *Malacosoma disstria*, *Plagiodera versicolora*, and *Rhyacionia buoliana*.

5. MENSURATION. INCREMENT. YIELD

5 : 07.7 : 01.7. BUELL, J. H. *Circular slide rules for solving linear equations.* *J. For.* 40, 1942 (26-32). [Appalachian Forest Exp. Sta.]

The advantages of circular slide rules for use in field work are mentioned and details are given for the construction of one such rule.

52. MEASUREMENT OF TREES AND TIMBER

52. DAVEY, R. *Measurement of trees.* Forest Press, Nutley, Sussex, England. 1942. pp. 236.

This book is a gallant attempt to improve the common British method of estimating timber volumes in standing trees and woods, which, for individual trees, is clearly described (p. 14) as:—

- “1. The breast height girth is taken at 5 ft. 0 in. above saw cut.
2. Height is measured to a timber point which has regard to the commercial uses of the timber.
3. The volume is obtained by estimating the quarter girth at mid-length, squaring it and multiplying by the timber height.
4. The unit of volume is the customary cubic foot, which is larger than the true cubic foot and therefore yields a volume which is lower than the mathematical contents of the tree.”

The estimation of quarter girth at mid-length is usually made as the relation to the measured quarter girth at breast height.

Hardwoods and softwoods are treated separately, the timber point in hardwoods being taken as one or other of the ‘stops’ caused by the departure of large branches from the trunk. These can be seen, and therefore their height can be measured, on the standing tree. Which of several ‘stops’ should be selected as timber point will depend on the valuation of the different log lengths. The author is dealing only with measurement of crops for valuation for sale, not with measurement for determination of growth, which may be a major concern of the forester and for which such a variable timber point might be unacceptable.

For softwoods the timber point is defined as the point at which the stem has a quarter girth over bark equal to one-third of the over-bark quarter girth at breast height with a minimum of $2\frac{1}{4}$ q.g. ($3\frac{1}{2}$ in. diam. O.B.). That is, timber point differs for trees 8 q.g. ($10\frac{3}{4}$ in. diam.) B.H.O.B. and under and for trees over 8 q.g. B.H.O.B. The first have a fixed timber point of $2\frac{1}{4}$ q.g.O.B. while the others have a timber point proportional to their breast-height quarter girth. This definition is used to reach a closer agreement with the actual utilization of the trees than could be reached by a timber point at some fixed dimension, as the smaller trees are utilizable as pitprops and stakes down to $2\frac{1}{4}$ q.g.O.B. while in the larger trees this point falls in the unutilizable crown. This timber point is not visible on the standing tree, however, and cannot be measured directly.

The author has prepared tables based on the work of Macdonald on the form of stem of coniferous trees in this country, giving firstly the percentage relation of timber height to total height by Q.G.B.H. and total-height classes for trees of average form class as found by Macdonald’s researches, or average taper class as used by the author, with corrections for one taper

class above or below this average by Q.G. classes, and secondly, a calculating table for reading off timber heights from the total height and percentage figures. These tables are given for European Larch—under 40 and over 80 years, Japanese Larch, Scots Pine, Corsican Pine, Douglas Fir, Norway Spruce—young and middle-aged, and Sitka Spruce.

This relationship having been found, the author has followed the same approach in the determination of the sectional area at mid-length (half timber height) using Macdonald’s percentile taper series. As variations in mid-sectional area due to taper have a far greater effect on volume than variations of timber height, the average taper series (i.e. Behre’s 70 Form Class as found by Macdonald) is insufficient for individual trees and ocular estimation must still be resorted to in deciding how far the taper of an individual tree varies from this average.

The author’s expression of taper is the percentage relation of the mid-sectional area to the breast-height sectional area, and a table is provided showing these percentages by quarter-girth and timber-height classes for trees of average taper for the same species as above, based again on Macdonald’s figures. The individual tree may vary considerably from this, and the author recommends estimation in taper classes at 5 per cent. intervals above or below this normal. Diagrams to show the form of stem of five taper classes, foreshortened and in perspective, are given to assist this estimate. A table is then provided giving mid-sectional quarter girths for breast-height quarter girth in 5 per cent. taper classes.

Data are not available for taper tables for hardwoods but such data as the author has collected are published as an indication that this method is also possible with hardwoods and what average tapers are to be expected, timber height being taken to the first, second or third ‘stop’.

From individual trees the author proceeds to the measurement of stands by sampling and the theory of sampling. He recommends the measurement of timber height and taper of a number of trees round the mean-basal-area tree and the use of the average height and average taper from this sample with the total basal area for the determination of the volume of the stand. The sample trees should be selected at random from the population within one or two girth classes of the mean. Direct measurements of timber height in conifers, and taper in both conifers and hardwoods, can be made directly only on felled trees, but by the use of instrumental height measurement of standing trees and estimates of taper with the tables provided the author considers sufficient accuracy can be obtained in the estimation of the volume of standing trees. Assuming a standard error of ± 2.5 per cent. in height measurement and a standard error of ± 5 per cent. in taper estimation he then calculates over several test stands the number of sample trees necessary for stated degrees of accuracy. This, however, rests on the assumption that errors of estimate of taper will be randomly distributed. The resulting numbers of sample trees are high compared to those commonly used in selective sampling.

For measurement of large stands and woods the author describes and recommends the methods of mechanically distributed line plots or strips. A. F.

52 : 07.1. POND, J. D. Log scaling and timber estimating: Forestry for 4-H Club boys and girls, fourth year—scaling and estimating. *Jun. Ext. Bull. Cornell Univ.* No. 39, (revised ed.) 1940. pp. 35.

52.1. Diameter

52.1. TISCHENDORF, W. Die Zopfstärke von Rundholz bei Kantholzerzeugung. [The top diameter of round timber for the production of squared timber.] *Forstarchiv* 16, 1940 (256–7). [G.g.] R.M.I.

The best rapid method for the approximate determination of the top diameter of a round timber from which squared timber or beams are to be cut is by adding the sectional dimensions, multiplying this sum by 7, dividing by 10, and finally adding 1 per cent. to the result.

52.2. Height, Length

52.2 : 61.32. SEELY, H. E. Determination of tree heights from shadows in air photographs. *Aer. For. Surv. Res. Note Dom. For. Serv.* 1, 1942. pp. 10.

The method is explained and its advantages, limitations, and sources of error are discussed. For the most part the errors are compensating, so that the average for a number of trees may be practically free from error. In certain circumstances the method has proved the most accurate means of obtaining tree heights from vertical air photographs, and has been instrumental in securing some highly accurate timber estimates.

52.3. Taper

52.3. DAVEY, R. Taper. *Quart. J. For.* 36, 1942 (18–22).

Chiefly a discussion of the use of British taper tables.

52.3 : 12.26–8. TIONGSON, C. A preliminary study of taper of some dipterocarp species. *Philipp. J. For.* 4, 1941 (223–46). [Bureau of Forestry, Philippines.]

Data on the taper of Tañgile (*Shorea polysperma*), Tiaong (*S. teysmaniana*), and Mayapis (*S. squamata*) in the Pañgil region.

52.4. Measurement of Volume

52.4. TISCHENDORF, W. Die neuesten Arbeiten und Aufsätze aus der Holzmassenermittlung. Kritisches Sammelreferat. [Recent works and papers on the determination of timber volume. A critical, collective review.] *Forstarchiv* 18, 1942 (17–32). [G.]

Thirty-three recent papers, mostly German, are reviewed.

52.4. NÄSLUND, M. Funktioner och tabeller för kubering av stående träd. [Formulas and tables for determining the volume of standing trees.] *Medd. Skogsförsöksanst. Stockh.* 32 (4), 1940. [Sw.] *Review in Skogen* 28, 1941 (79–80). [Sw.] L.S.

Equations for determining form factor and volume over and under bark for Scots Pine, Norway Spruce, and Birch in Northern Sweden have been derived by statistical analysis of extremely comprehensive data from permanent and temporary sample plots and felling areas. Two types of formulas have been prepared, a simple one requiring knowledge of d.b.h. and height only, and a more accurate one requiring knowledge of the height above ground to the base of the crown, not counting any isolated green branches separated by 3 or more dead whorls from the body of the crown. Only the simpler type of formula has been prepared for

trees under 5 cm. d.b.h.; volume tables have been worked up from the simpler type of formula for all diameter classes. An example of one of these empirical formulas (for Pine) is $V = 0.1018 d^3 + 0.03112 d^2 h + 0.007312 d^2 k - 0.002906 d h b$, where b = double bark thickness in mm., d = d.b.h. over bark in cm., h = tree height from ground level in m., k = height to base of crown in m., and V = volume in cu. dm. Studies have been made of the comparative results given by the form-point method and the new method, and the latter has been shown to be more accurate. The new method does not involve subjective judgment as does the determination of the form point. It is intended to produce similar tables and formulas for the remainder of Sweden.

52.43.2. CHAPMAN, H. H. The International log rule for $\frac{1}{4}$ -inch kerf. Can it replace the Doyle rule? *J. For.* 40, 1942 (224–34). [Yale University.]

The International log rule for $\frac{1}{4}$ -in. kerf is officially recognized by the U.S. Forest Service as an optional rule for scaling government timber, and it is generally accepted in the southern United States and elsewhere as the standard for timber estimating and growth measurements. The International scale showed an overrun of less than 2 per cent. for Pine in extensive saw tests made in New England, and tests in the southern United States show its adaptability for scaling small logs. The defects of the Doyle rule are set forth and the source of error restated. An important modification of the Doyle rule for scaling small logs is explained.

52.43.2. COPE, J. A. Concerning the board foot and the Doyle rule. *J. For.* 40, 1942 (235–7). [Cornell University.]

Reference is made to the inconsistencies in log scaling practice and the measurement of forest products in the United States. The use of the Doyle rule discourages the marketing of small logs and encourages poor scaling. It is suggested that selective cutting will become a more general practice in farm woodlands when the price for every log delivered is based on grade.

52.43.2. WILSON, S. E. Measuring round timber: the Hoppus system. *Scot. For. J.* 55, 1941 (64–71).

After dealing briefly with the usual methods of finding the dimensions of a log, the author explains the Hoppus system of calculating the contents from these dimensions, resulting in a unit equal to 1.27 cubic feet. He gives a historical explanation of the Hoppus system and proposes that the unit be known as the 'Hoppus Foot.' *From author's summary.*

52.43.2 : 01.7. NEFF, P. Comments on 'The application of sampling to log scaling'. *J. For.* 40, 1942 (54–6). [U.S. Forest Service.]

A critical analysis of the possibilities of applying the sample-log scaling method [cf. *For. Abs.* 3 (259)] to practices in Region 1 of the U.S. Forest Service. The conclusion is against its adoption. Disadvantages of the method that are suggested include:—(1) lack of confidence in sample scaling and suspicion of its use on the part of the industry; (2) reduction in valuable training for new technical assistants; (3) possible delay of trucks while scaling, with a consequent financial loss; (4) savings that could be made by using sample-log method would be confined to scalers' wages and in total cost the new method might be more expensive than those now used.

52.43.3 : 12.26-8. EMMER, R. E., KUENZEL, J. G., and KELLOGG, L. F. Volume table for White Oak (*Quercus alba*), Union, Jackson, and Hardin Counties, Illinois. *Tech. Note cent. St. For. Exp. Sta.* No. 54, 1942. p. 1.

52.46 : 01.7. HASEL, A. A. Sampling error of cruises in the California Pine region. *J. For.* 40, 1942 (211-7). [California Forest & Range Exp. Sta.]

Estimates are made of the average accuracy of cruises in Pine stands in California and methods are outlined for estimating the accuracy for particular cruises.

52.46 : 52.43. EHRHART, E. O. A tally sheet to represent volume graphically. *J. For.* 40, 1942 (265-7). [Armstrong Forest Co.]

The tally sheet is designed so that spaces in the shape of adjacent rectangles represent graphically the volume of each tree tallied, according to species and diameter. Area of rectangles tallied can be read directly in cords of wood and a close approximation to the volume tallied can be seen at a glance. As unit volumes are fixed for each diameter class, a scale of converting factors is necessary in adjusting volume production to diameter for local variations in site quality.

53. SOLID CONTENTS OF STACKED MATERIALS. REDUCING FACTORS

53 : 51. Measurement of stacks of wood billets—a correction. *Mon. News Lett. Div. For. Prod. Aust.* No. 119, 1941 (2).

Cf. *For. Abs.* 3 (259). The standard cord in Australia is a stack of 128 cu. ft. of wood billets and the cord of 125 cu. ft. is a Victorian modification.

56. INCREMENT

56.02 : 11.21. BÖHMER, J. G. Reliability of determinations of wood increment under fluctuating climatic conditions. *Papir-J.* 29, 1941 (216-26). *Abstr. in Auszüge aus der Literatur—suppl. to Papierfabrikant* 40, 1942 (14). [G.] P.R.

The author concludes from his investigations that the magnitude of the errors due to fluctuation in climate and site quality is hardly significant in increment determinations during forest surveys.

56.02 : 11.21 : 09.2. DOUGLASS, A. E. Notes on the technique of tree-ring analysis, III. *Tree-Ring Bull.* 8, 1941 (10-6).

56.02 : 11.21 : 09.2 (43.1-5). HUBER, B. Aufbau einer mitteleuropäischen Jahrringschronologie. [Development of a central European annual ring chronology.] *Mitt. H.-Göring-Akad. dtsh. Forstwiss.* 1, 1941 (110-25). *Abstr. in Forstarchiv* 18, 1942 (12). [G.]

Annual-ring diagrams have been prepared for Scots Pine in the Tharandt forest during the 19th century. The fairly constant extreme values show clear correspondences with the variations of precipitation in the area. Ring variations were also studied back to 1690 for Silver Fir and Yew from the Upper-Bavarian Tyrol. By establishing a marked sequence of 8 narrow rings it was possible to show that 19 out of 24 palisade stakes from a pre-historic settlement were of the same age. The variation occurred uniformly in 5 tree species.

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

57.0 : 12.25 : 21.6. Crown development in Red Pine plantations. *Silvic. Leaflet. Dom. For. Serv.* No. 6, 1941. p. 1.

Of the various indices of growth studied on the sample plots, prior to thinning, basal area showed the best correlation with crown development. In pruning, the reduction of crown length beyond approximately two-thirds of the total height will materially decrease basal-area increment.

57.0 : 12.25 : 21.6 : 24.2-3. TOMA, G. T. Kronenuntersuchungen in langfristigen Kieferndurchforstungsflächen. [Crown studies in long-term Scots Pine thinning plots.] *Z. Forst- u. Jagdw.* 1940 (305-40, 379-404). [G.] *Abstr. in Forstarchiv* 18, 1942 (38-9). [G.]

Within the same stand the thicker stems had broader and longer crowns. Stems of the same diameter had broader, but generally not longer crowns in open, even-aged stands. In all stems of a stand the crown began at about the same height. With increasing age of stand there was a constant increase in the length of clear bole. The ratio of crown breadth to crown length in the stands examined was between 0.5 and 0.8 and was independent of stem diameter and stand density. Breadth of crown increased rapidly with increasing diameter and most strongly so in the thick stems. With the medium and heavy thinning grades stems of the same diameter had greater crown breadths than with the light grade, and breadths were still greater in open stands. The longest Pine crowns rarely exceeded 40 per cent., and the shortest were below 20 per cent., of total tree height, whereas for Spruce the corresponding figures are over 50 per cent. and seldom below 25 per cent. The same Kraft stem classes had about the same crown-length per cent., regardless of stand density and age. Crown breadth was about 10 per cent. of tree height in the thinnest and about 30 per cent. in the thickest stems. The thicker stems had greater diameter increment in youth than the thinner ones, but the difference decreased with age. In open stands diameter increment was almost independent of stem diameter. In most of the plots the diameter increment per cent. was almost equal for all stems, only the suppressed trees showing a lag. Similar conditions held for the relation between diameter increment and basal area of crown, as the thicker stems generally possessed broader crowns. Basal-area increment also increased with increasing area of crown base, but not proportionally. In spite of differences in stem number, no marked difference existed in the total crown area per ha. as between the various thinning grades, though the open stands lagged by at least 14 per cent. behind those under medium thinning. This contrasts with Spruce, which has a larger crown area under the light grade of thinning. It was not possible, by tending measures, to increase the absolute number of stems with good crowns, but the relative number was greater in the more open plots. Total crown volume per ha. seems in Pine to be independent of stand density, but increases with age. In the more heavily thinned plots the mean stem had a greater stem diameter, crown breadth and crown length. The height to crown base of the mean tree was mostly lower in the more open stands; tree height and the crown-breadth/crown-length ratio remained unaltered.

6. MANAGEMENT. WORKING PLANS. SURVEYS

6. MANTEL, W. Über die notwendige Genauigkeit bei der Forsteinrichtung. [On the required accuracy in forest regulation.] *Forstarchiv* 17, 1941 (307-15). [G.g.]

The minimum accuracy of data on which working-plan prescriptions are based depends on the extent to which deviations from the proposed results of these prescriptions can be tolerated. The chief aim of regulation being the maintenance of a sustained yield, the maximum allowable deviation from the desired growing stock should preferably be used as a starting point in determining the required accuracy of the basic working-plan data. Consideration is given to the effects on the forest capital of errors of different magnitude in the area and volume statistics on which the prescriptions are based.

6:07.2. MANTEL, W. Über Forschungs- und Arbeitsweise bei der Forsteinrichtung (Forsteinrichtungsmethodik). [On research and working methods in forest organization ('methodology' of forest organization).] *Allg. Forst- u. Jagdztg.* 118, 1942 (10-20, 47-55, 74-80). [G.]

A general discussion. Since organizing the management of a forest unit is largely a planning operation, and since planning is essentially conditioned by its aim, forest organization demands in the main a deductive approach.

60. GENERAL LAND MANAGEMENT

60:34.21:32:97.3. HORMAY, A. L. The effect of logging on forage. *Chron. bot.* 6, 1940 (6-7). [California Forest & Range Exp. Sta.] O.B.D.

A study has been initiated at the Burgess Spring Experimental Range, Lassen County, California, to determine whether disturbance of vegetation and soil by logging operations affects pasture sufficiently to require adjustment of the head of livestock. At the time of cutting, in 1936, the experimental area carried a mature to over-mature, open stand of *Pinus jeffreyi*, *P. ponderosa*, and a few small patches of *Abies concolor*, the volume per acre being about 15,000 bd. ft. Logging was done by tractor and arch equipment, and slash and debris were left on the ground and fire-protected. Comparison of conditions before and after logging showed that more than a third of the area was disturbed, 14 per cent. was skidded relatively free of vegetation, litter and debris, and 24 per cent. was covered by slash. The total immediate reduction in forage is estimated at 19 per cent. Perennial herbs and especially deep-rooted species suffered least, while the more palatable forbs and grasses seemed to be the most readily removed by logging. However, general field observations in this part of California suggest that forage is reduced for a year or two after logging, then rapidly increases and surpasses the capacity of the virgin woodland, and finally begins to decrease once more as tree reproduction becomes established. Further study is needed to confirm this and to furnish data that could be used in forest-cum-range management."

60.2. Management of Tree Plantations under Non-Forest Conditions

60.2 (66.9). PITCAIRN, G. D. Tree planting on farm boundaries in Plateau Province. *Farm & Forest* 2, 1941 (103-6).

A brief account of the problems connected with afforestation on farmland in the Plateau Province of Nigeria, particularly in interesting the pagan farmers in this work, and of the results so far obtained.

60.3. Management of Different Classes of Forest

60.31 (75:76):12.19.2:34.26. BREWSTER, D. R. Possibilities of integrated utilization in the Longleaf-Slash Pine type. *J. For.* 40, 1942 (134-7).

60.31.1 (67.6):22.89:76.1:82. Plantation management: costs and practical hints. *Bull. For. Dep. Kenya* No. 34, 1939. pp. 19.

Notes for the guidance of Kenya foresters.

60.31.2 (75:76):97.4. McCaffrey, J. E. Progress in industrial forestry.—With discussion. *J. For.* 40, 1942 (89-95). [International Paper Co.]

(i) It is shown that while some form of forestry was practised on approximately 4,780,000 acres in the southern States in 1925, this had increased to 21,609,000 acres in 1940 and somewhat less than half of the latter was under intensive management. (2) In 1925 some 35 million acres of forest were under co-operative fire protection and this has now increased to 88,600,000 acres. (3) State-owned nurseries produced less than 500,000 seedlings in 1927 and about 64 million seedlings in 1939.

60.31.2:94.4 (75:76). OETTMEIER, W. M. Southern forest farmers organize. *J. For.* 40, 1942 (52-4). [Forest Farmers' Association Cooperative.]

A note on the development and policy of the Forest Farmers' Association Cooperative whose members represent 2,500,000 acres of forest land in the States of Georgia, Florida, South Carolina, Alabama and Mississippi.

61. SURVEYING. MAPPING

61.31:07.7. DICKERSON, L. M. An inexpensive planimeter. *J. For.* 40, 1942 (19-22). [Soil Conservation Service.]

The hatchet planimeter described is made of a steel rod about $\frac{9}{16}$ in. in diameter, bent at right angles about 3 in. from each end. One end is made with a tracing point and the other with a knife edge. The two points should lie approximately in the same plane and 10 in. apart, the distance between them being measured with reasonable accuracy. This instrument gives results comparable in accuracy to the polar-type planimeter. Details of operation are included.

61.31:07.7. MANAHAN, M. D. The use of the penknife for determining areas. *Philipp. J. For.* 4, 1941 (257-65). [Bureau of Forestry, Philippines.]

Description of a method for determining small areas using a penknife as a substitute for a planimeter. The method is shown to be fairly accurate.

61.31 (213). WEDDERBURN, L. C. M. Sound survey in the rain forest. *Farm & Forest* 2, 1941 (147-50).

A method of survey for use in reserve selection and the demarcation of farmlands in the rain-forest region, where paths and boundaries are often crooked and visibility limited. The instruments used include a

prismatic compass and a chain or similar device. First the chain is run out from the starting point a predetermined distance along the path to be surveyed. A peg is driven into the ground with the chainage distance inscribed. A man standing at this peg calls back

along the path and the compass is swung in the direction of the sound and after a number of checks the bearing is recorded. In the meantime the chain-men go forward again. Advantages and disadvantages of the method are noted.

7. FOREST ECONOMICS, VALUATION AND FINANCE

73. OSTWALD, H. Gibt es einen besonderen, sogenannten 'forstlichen Zinsfuß'? [Is there a special 'forestry rate of interest'?] *Forstwiss. Cbl.* 63, 1941 (193-208). [G.]

The writer argues that the concept of the forest per cent. can be dispensed with.

76 : 60.31.2 : 22.88.2 (79.4). JOSEPHSON, H. R. Factors affecting income from second-growth forests in the western Sierra Nevada. *Bull. Calif. agric. Exp. Sta.* No. 658, 1941. pp. 72.

These forests cover an area of about $1\frac{1}{2}$ million acres, are largely privately owned, and contain varying proportions of *Pinus ponderosa*, *P. lambertiana*, *Pseudotsuga taxifolia*, *Libocedrus decurrens*, and *Abies concolor*. The paper discusses factors affecting timber yields, timber values, and forest incomes. Suggested measures to increase the latter include intensification of fire protection, deferment of the utilization of immature stands, selective cutting, centralized management and utilization, forest research, and the use of adequate written agreements in the sale of forest produce.

8. ADMINISTRATION

81 (71.5). *Forest Service manual*. New Brunswick Forest Service, Fredericton, N.B. Revised ed., 1940. pp. 110.

This manual presents details of the organization of the Forest Service, of legislation and other measures relating to the prevention of forest fires, and the

organization and equipment maintained for the detection and suppression of forest fires. A chapter is included on forest insects and their control.

81 : 82. GRAVES, P. F. *Morale in public forestry organization in the United States*. *Tech. Publ. N.Y. St. Coll. For.* No. 53, 1941. pp. 108.

9. FOREST POLICY

90. GENERAL PRINCIPLES OF FOREST POLICY

90 (43.7). RAUSCH, H. Gegenwarts- und Zukunftsaufgaben der sudetendeutschen Forstwirtschaft. [Present and future tasks of Sudeten-German forestry.] *Thar. forstl. Jb.* 92, 1941 (621-38). [G.]

Included are general data on forestry in the region; notes on past and present forest management, with suggestions for the future; and an account of the present State forest administration.

90 (560). BERNHARD, R. Die Grundlagen der Forstwirtschaft—von der Natur gegebene—von den Menschen zu schaffende—am Beispiele der Türkei. [The foundations of forestry—as laid down by nature and to be created by man—exemplified by conditions in Turkey.] *Mitt. H.-Göring-Akad. dtsh. Forstwiss.* 1, 1941 (181-98). *Abstr. in Forstarchiv* 18, 1942 (14-5).

90 (75 : 76). ELDERIDGE, I. F. *Forestry in the future of the South*.—With discussion. *J. For.* 40, 1942 (140-3). [Southern Forest Exp. Sta.]

91. SOCIAL AND ECONOMIC SIGNIFICANCE OF THE FOREST

91. LOUCAIDES, T. C. The economic and hygienic benefits of forests. *Forest Treasures*, Nicosia 3, 1941 (17-22).

91.1. *Rural Preservation. Reserves. National Parks. Plant and Animal Protection*

91.1 (73 : 71.4). GOBEL, R. La cynégétique aux États-Unis et chez nous. [Wildlife conservation and management in the United States and in Quebec.] *La Forêt Québécoise* 4 (1), 1942 (29-48). [F.]

92. FOREST LAW

92 (71.4) : 99 : 82. *Minimum Wage Commission. Ordinance No. 39. Employees occupied at Forest Operations*. *Extr. from Quebec Official Gazette*, May 3, 1941. pp. 9.

92 (73) : 90. *Drastic features in new Senate forest bill*. *W. Cst. Lumberm.* 69 (1), 1942 (56).

With reference to Senate Bill 2043, known as the Forest Omnibus bill, which has been introduced into the United States Senate 'to effectuate the recommendation of the Joint Congressional Committee on Forestry.'

92 (79.4) : 43.1. *State of California Forest and Fire Laws, 1940*. Supervisor of Documents, 214 State Capitol, Sacramento. 1940. pp. 190.

94. FOREST OWNERSHIP

94 (43.6) : 97. DIETERICH, V. Die Aufgabenverteilung zwischen Staatswald und Privatwald unter dem Blickpunkt angespannter Leistungssteigerung von Land- und Forstwirtschaft. [The distribution of tasks between State and private forest from the point of view of co-ordinated increase of production in agriculture and forestry.] *Mitt. H.-Göring-Akad. dtsh. Forstwiss.* 1, 1941 (13-38). [G.] *Abstr. in Forstarchiv* 18, 1942 (40-1). [G.]

With particular reference to the distribution of forest in Austria by ownership, administrative regions and vegetational regions, and to the need for adjustments therein.

94.12 (73) : 60.31.1. *Report of Committee on Community Forests* [Society of American Foresters]. *J. For.* 40, 1942 (112-7).

96. POLICY REGARDING PROTECTION FOREST

96 (47.2-6) : 91.3 : 92 : 11.6 : 23.3 : 24.4 : 11.2. BUCHHOLZ. Der Wald als Klimafaktor in der russischen Ebene. [Forest as a climatic factor in the Russian plain.] *Z. Weltforstwirtschaft*, 8, 1941 (355-90). *Abstr. in Forstarchiv* 17, 1941 (350-2). [G.]

Between 1804 and 1914 the percentage of forest declined from 44 to 36 and has since shown a further decrease. This has been followed by droughts in the steppe region, swamp formation in the coniferous forest zone (taiga), and the silting of rivers with the restriction of transport on inland waters. Forestry measures to improve the water régime have been based on the knowledge that forests decrease moisture in the plains and increase moisture in the mountains. In the swampy northern plains the forest has a draining effect and the moisture transpired is carried by the wind to the southerly steppes and deserts. The steppe zone has too little precipitation (230 mm. per annum) for proper forest, but narrow shelterbelts are useful in promoting even snow distribution and in protecting fields from drying winds. They have also proved to be the only effective means of combating shifting sand. In the mountainous regions the value of forests in torrent regulation and erosion control has been recognized, and efforts in the northern plains region are being directed towards afforestation and good silvicultural practice. In 1936 a decree was enacted regarding the 'water-protection zone' and regulations were laid down for the safeguarding of continued harvests in the drought-endangered regions. The 'water-protection zone' comprises all blocks of forest in the central region of European Russia in the catchments of the Volga, Don, Dnieper, Ural, and the upper course of the Western Dvina, including all tributaries, the area concerned being almost 70 million ha. Cutting is prohibited in a strip 4-20 km. broad on either side of these rivers, while on the remainder of the area clear cutting is permitted but the total yearly cut must not exceed the increment, which is estimated at 2.3 cu. m. per ha. per annum.

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

97.1 (66.9) : 11.62.1 : 60. OLIPHANT, J. N. **Planning for conservation.** *Farm & Forest* 2, 1941 (117-24).

The importance of preserving the natural resources, particularly the fertility of the land, was emphasized by the Secretary of State for the Colonies in a recently published White Paper. The present author, using the term 'conservation' as embracing all measures designed to maintain soil fertility, suggests that the responsibility for conservation must be assigned to some one organization, possibly a Conservation Service, the function of which 'would be to examine areas showing signs of serious degradation, prepare plans for their rehabilitation and exercise general supervision over the carrying out of these plans by the local authorities concerned'. A possible plan of action for the Conservation Service is suggested.

97.1 (73) : 92. UNITED STATES. **Digest of outstanding Federal and State legislation affecting rural land use (index and status of bills, January 1, to June 15, 1941).** U.S.D.A. Bureau of Agricultural Economics, Washington, D.C. [1941?]. pp. 128. *L.E.—Bulletin* 67.

97.2 (410) : 60.31.2. **Estate forestry after the war.** *Scot. For. J.* 55, 1941 (60-3).

Revised memorandum of the Royal Scottish Forestry Society on post-war policy for privately owned woodland in Scotland.

97.2 (410) : 60.31.2. RODGER, SIR A. **Suggestions for a plan.** Part II. *Quart. J. For.* 36, 1942 (8-15).

The proposals of the writer regarding the improvement of private forestry in Britain [cf. *For. Abs.* 3, 1941 (91)] are supported by quotations from letters and recent publications of various interested persons. Most of those who have expressed an opinion appear to agree that an improvement in the standard of technical administration is a primary necessity.

97.2 (410) : 60.31.2 : 23.3. LOTBINIÈRE, H. G. J. **DE Afforestations by County Councils.** *Quart. J. For.* 36 1942 (16-7).

It is suggested that after the war County Councils should be appointed as the Forest Authority for privately owned land in Britain. Each County would appoint its own forestry committee having a fully qualified technical staff at its disposal. The forestry committees would be in charge of woodland inspections and advisory activities. In cases where a landowner is unable or unwilling to undertake the work required for the proper maintenance of his woodlands, the necessary work would have to be undertaken by the committees and the cost recovered by annual payments over a number of years. Should a divergence of opinion arise between the owner and the committees, the Forestry Commission would be the final arbitrator. The committees, through their technical staffs, would also be required to assist owners to market their forest produce. As a principle, owners would have to pay on a moderate scale for services rendered. In the early years these payments would not be sufficient to meet the expenses of the technical staff, and the balance would presumably have to be provided by the National Exchequer and the County Councils.

98. THE TIMBER MARKET

98 (410) : 33.91. **Timber sizes and availability.** Timber Development Association, Ltd., 75, Cannon Street, London, E.C.4. 1941. pp. 2 + tbls.

A list of timbers imported into Great Britain, indicating for each the availability ('plentiful', 'in moderate supply', 'scarce', and 'none available') and the range of dimensions that can be ordered from merchants.

98 (52). AINSLIE, J. R. **Japan and the timber trade.** *Wood* 7, 1942 (85-7).

It is thought that the timber and minor forest produce previously imported by the United Kingdom from the East and from Australia will have to be largely replaced by supplies from British, Allied, and possibly neutral territories in West Africa, possibly by supplies from South America, and by home-grown timber.

98 (7 : 8) : 99. FORSLING, C. L. **The significance of forestry in inter-American relations.** *J. For.* 40, 1942 (161-5). [U.S. Forest Service.]

This conference paper discusses the character and abundance of the forest resources of Latin America, and the utilization, export and import of forest products by the Latin American countries. The forest resources

of these countries are largely unexploited and do not make an adequate contribution to the national economy, either as regards domestic consumption or export. Ways are suggested by which the United States might help to improve forest utilization and forestry in these countries.

98 (72-729 : 8) : 3. RECORD, S. J. **Factors in the utilization of Latin American timbers.** *J. For.* 40, 1942 (165-8). [Yale University.]

With reference to the factors affecting local utilization and the export of these timbers.

98 : 99 : 91.7 : 33. GLESINGER, E. **The impact of the war on forest industries (a preliminary review).** *J. For.* 40, 1942 (6-11). [Comité International du Bois.]

Consideration is given to the present timber production and trade in Europe under Nazi domination, to the probable position in regard to timber resources and requirements in post-war Europe, to war-time developments in wood utilization and wood substitutes in various European countries, and to the many problems affecting world timber trade and utilization that result from these conditions.

NOTES FROM THE DAILY AND THE NON-TECHNICAL PRESS

References: 1. *Canadian Business*, Montreal. 2. *Domestic Commerce*, Washington. 3. *Financial Post*, Toronto. 4. *Foreign Commerce Weekly*, Washington. 5. *Garonne*, Toulouse. 6. *Jornal do Comércio e das Colônias*, Lisbon. 7. *Journal*, Lyons. 8. *Krakauer Zeitung*, Cracow. 9. *Mercurio*, Santiago and Valparaíso. 10. *Montreal Gazette*, Montreal. 11. *Neue Züricher Zeitung*, Zurich. 12. *Primeiro de Janeiro*, Oporto. 13. *Svenska Dagbladet*, Stockholm. 14. *Vancouver Sun*, Vancouver. The numbers in brackets indicate the reference number and the date of publication of the newspapers and journals to which the annotations refer.

Canada. The harvesting of over 300 tons of Cascara bark annually in British Columbia (the sole Empire source) gravely threatens the future of this essential medicinal tree. The British Columbia Government is reported to have initiated a programme for its conservation and propagation (14; 7.3.42).

Chile. The budget for the current year provides for an expenditure of 1 million Pesos (Exchange approximately 95 Pesos = £1) for afforestation and other forestry work in northern Chile. Part of this sum is to be expended on the acquisition of the 'Fray Jorge' forest, which is to become a nature reserve (9; 17.2.42).

Uncontrolled burning of forest clearings prior to agricultural cultivation is reported to have recently resulted in the destruction by fire of comparatively large forest areas adjoining such clearings. State action is advocated to stop this wasteful practice (9; 14.2.42).

France. The timber supply position was summed up recently in a speech at Bourges by M. Caziot (5; 17.2.42). He pointed out that immediately after the Armistice the Forestry Department had to face an enormous increase in the consumption of timber products of all kinds, together with an almost complete cessation of timber imports. A law of the 6th August, 1940, mobilized the forest resources of the country (obliging all forest owners to increase fellings by 50 per cent.), and Government forestry camps had been organized even earlier. Before the war there were 150,000 workers in the French forests; 225,000 would be needed to satisfy the most urgent needs of consumers, but it had so far been impossible to make any increase on the peace-time figure. However, monthly production of charcoal had increased from 15,000 metric tons before the war to 52,000 tons, that is from 270,000 to 960,000 cu. m. Production of wood for heating, bakeries, producers, and charcoal manufacture had risen from 14.8 million stacked cu. m. in 1939 to 30 million in 1941. *The Journal* (7; 31.1.42) pointed out that not since the beginning of this century had so much wood been used for heating, but present supplies would have to be multiplied by six to satisfy requirements. One of the chief hindrances to forest production, according to a previous article (7; 29.1.42), was the lack of labour, as people were unwilling to work in the forests, partly because of the difficulty of obtaining enough food to take with them. Another difficulty was the shortage of horses for extraction work. Horses were very dear, and many had been lost in the war. The article proposed that the youth organizations Chantiers de la Jeunesse and the Compagnons de France should organize transport companies for forestry work. Later the same paper (7; 20.2.42) reported that a similar scheme had already been put into practice in the Drôme and Ardèche Departments, which constitute one division of the Forestry Department and one 'Groupement Interprofessionnel Forestier'. (Note: the forestry profession is organized on corporative lines, with a 'Comité Central des Groupements Interprofessionnels Forestiers' at its head.) The forestry commissioner in this division had called in the help of the unemployment authorities, who had provided him with the necessary labour and themselves assumed the task of feeding and lodging these workers and of providing tools and equipment.

A law of the 21st January, 1942, was promulgated to further afforestation. Although forests covered 11 million ha., a fifth of the total area of France, many more uncultivated areas could be planted with trees. During the last 50 years, 500,000 ha. had been planted without detriment to agriculture or stockbreeding, but now a still greater effort must be made and the work of the State must be supplemented by that of private owners. The new law provided for the afforestation of 250,000–300,000 ha. in 10 years, particularly in the Landes, the Montagne Noire, and the Millevaches plateau in the Limousin. Certain districts would be marked out for compulsory afforestation, and the landowners must notify the Department within two months whether they intend to undertake the planting themselves with the aid of Government subsidies, or to allow the State to do so (7; 26.1.42 and 31.1.42).

Germany and Poland. A writer in the *Krakauer Zeitung* (8; 28.2.42), dealing with the timber situation in central Poland, stated that there were neither the amounts of timber available nor the prospects of increased production that people had imagined. This presented Germany with a very special problem. A beginning was made in April, 1941, by creating the first Forestry Station with Dr. Mantel of Dresden as director. It was attached to the Central Government, and its chief task was exploitation rather than investigation. A report of a later date in the same paper (8; 28.4.42) told of the organizing of forest resources in the Fifth Province (Galicia) under the management of Councillor Hauer. The total area was 1,140,600 ha., divided into 8 sections, each of which had 12 senior foresters in charge. Over 50,000 men were engaged in these forests at the end of 1941. Some 218 sawmills and planing mills were in operation, 12 of which were used for manufacturing furniture and employed 800 men. The badly dislocated railway transport had created serious problems for the handling of timber, but every month conditions were improving.

A new regulation controlling the use of producer fuelwood in the General Government has been issued. The fuelwood will be manufactured under State supervision and sold in accordance with a fixed scale of prices (8; 26.2.42).

Great Britain. Britain is now getting her entire supply of newsprint, cartons, and gummed kraft paper, and 65 per cent. of her wood pulp, from Canada and Newfoundland (10; 13.3.42).

Mexico. The demand for timber is greater than ever with prices firm and increasingly large exports to the U.S.A. (4; 24.1.42).

Newfoundland. Production of timber in 1941 is estimated at 35 million bd. ft. There were 730 sawmills in operation. Production in 1940 totalled 27 million bd. ft. (4; 14.3.42).

Portugal and Colonies. The *Primeiro de Janeiro* (12; 8.4.42) noted the serious state of the timber export trade, which had declined from 334,656 metric tons and 60,766 contos in 1940 to 72,196 tons and 29,053 contos in 1941 (Exchange 1 contos = £10). The principal fall was in pitprops, which dropped by 228,811 tons and 28,009 contos.

During 1941 exports of all kinds of cork amounted to 192,213 tons. There were 368 factories for various cork processes in Portugal, 215 of which were not working last June, thousands of workers being unemployed in consequence (6; 7.4.42).

Exports of resinous products had risen from 1,300 contos in 1920 to 81,336 contos in 1939, and it was calculated that rural workers benefited annually to the extent of 50,000 to 60,000 contos from the resin trade. In 1940 the National Resinous Products Board had 13 instructional centres in operation, particularly in the Minho and Beira Districts (6; 17.4.42).

A five-year afforestation plan to cover 500 ha. has been announced for Cape Verde (6; 16.4.42).

Sweden. An agreement was signed in Berlin on the 23rd January for the establishment of a joint forest and timber goods committee for the purpose of discussing scientific, technical and economic questions and examining the conditions for exchange of timber goods. The possibility of other European countries joining the committee had been provided for. The Swedish press pointed out that the character of the committee was purely consultative and that its members had no influence on trade relations (11; 26.1.42) [compare notes under 'Germany' in *For. Abs.* 3, (359)].

Negotiations between representatives of the Swedish timber industry and the German authorities concerning credits and prices have resulted in an agreement in regard to the pulp and paper trade, and a further agreement regarding the sale of timber goods has also been concluded. Some improvements in prices and credit conditions are said to have resulted. No quota has so far been fixed for the next six months, but there is reason to believe that at least 100,000 standards can be purchased by Germany (13; 20.3.42).

United States. From an article by C. Slifko (2; 5.3.42):—The Bureau of Foreign and Domestic Commerce has estimated that during 1941 more than 75 per cent. of the timber produced was used directly or indirectly for war purposes and to meet essential civilian requirements. In 1942 direct and indirect war needs are expected to total about 30 billion bd. ft., or over 80 per cent. of production. At the beginning of the year, the demand from these sources continued at the high levels of the period immediately following the attack on Pearl Harbour. Production, after an 8-per-cent. gain in December, increased 5 per cent. in January. In the past year, deficits were made up from stocks, but at present these are low and unbalanced, with a substantial percentage reserved for unfilled orders.

From an article by F. H. Awalt and B. M. Frost (2; 19.3.42):—Heavy demand for paper and paper board in 1942 and difficulties in the way of manufacturing the necessary pulp are expected to make the pulp supply problem acute during the year. Several factors other than the greatly increased need for paper and paper products may contribute to pulp shortages. Of primary importance is the lack of sufficient labour in the woods. In some areas only 50 per cent. of the normal labour supply is available, and one mill in New England has only 25 per cent. of its usual force in the woods. A similar condition in Canada may reduce pulpwood imports by 20 per cent. Of almost equal importance is the tire situation, which threatens delivery of logs to mills. Current rationing would not provide enough tires for pulpwood deliveries. This condition has been met in New England, northern New York, and the North Central States by granting tire priorities for a 3 months' period to pulp mills. War-time uses will also contribute to shortage of paper pulp. The production of bleached sulphite pulp for nitrating purposes increased from 100 tons per day to 300 tons per day during February.

The War Production Board has been granted power to regulate and dispose of the total supply of wood pulp, both domestic and imported, as from 1st May. The Board will be able to allocate supplies to any mill or processor in order to obviate serious local shortages (3; 21.3.42).

Chlorophyll is being used to treat paper wrappings for citrus fruits in Florida. It prevents decay and it is hoped that, when the process is further perfected, little or no refrigeration may be needed to protect fruit in shipment (1; February, 1942).

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